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The Age of Armor

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THE AGE OF ARMOR

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by

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Abstract

This project studied four unique and intriguing armors from the Higgins Armory Museum collection and presented three of the suits in an educational, fourteen-minute video-documentary. These armors are all characteristic pieces of their respective points in history—Europe and Japan from the 15th to 18th centuries—painting the history of their eras. The project team researched and documented the armors, generated a script, filmed footage, and created a video-documentary to be shown to museum visitors.

Acknowledgments

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Authorship

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All other components of this report and project were completed equally throughout the team.

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Introduction

The purpose of this project was to document the history and origins of four armors from the Higgins Armory Museum: an Italian Late Medieval Battle armor (2607), a German Rental Jousting armor (2580), an English Pikeman armor (360) and a Japanese Samurai armor from the Edo Period (3144). We studied topics such as the history of the times during which they were created, the types of weapons that would be used with the armor, the development and creation of the armor itself, and the history of the people inside the armor in order to better understand the armor's use during its era of history. This allowed us to analyze the differences between the armors, understand differences between cultures of the same time, and differences between the same culture in different times in order to see how armor evolved through the ages. These topics were then reworded into general terms that the general public would understand, and the final product was a video-documentary approximately twelve to fourteen minutes in length to be put on display at the museum.

The Italian Late Medieval Field Battle Armor (accession number 2607) is a steel plate, composite armor with some modern restorations alongside some original pieces. Its estimated years of creation are approximately 1440-1505. It weighs about 54lbs, the usual weight for a battle armor of its time, and its original pieces were made by men such as Giovanni da Garavalle, Negroli, and an unknown Flemish master. By studying the history of Europe in this era, we

discovered the meaning of being a mounted, aristocratic knight. This, combined with history of the suit itself, as well as the weapons that would be paired with it, helped paint the picture of the medieval knight in this suit.

As is well known, plate armor was not always used just for the battlefield. It was also remodeled for use in sporting events. Thus, the second of the armors is a Late Medieval Composite Stechzeug, armor for the German Joust. This armor (accession number 2580) dates around 1480-1540, is made of steel, brass and leather, and weighs in at 60 lbs, 5 oz. This armor specifically hails from the smiths of Nuremberg, Germany and was standard rental armor for nobles participating in tournaments. In order to paint the picture of this suit in the Joust, we looked at topics such as the history of jousting and tournaments in order to shed light on the different types of games. By connecting the standard jousting equipment, such as the horse and lance, to this suit, we were able to further paint the picture and set the scene for this armor.

As time went on, plate armor became outdated as it was heavy and could not withstand new and improving technology. Adjustments had to be made in order to allow for the most efficient armor possible. This led to the selection of the English Pikeman

half-armor (accession number 360). Weighing in at a far more manageable 14 lbs and 8 oz, it had more advantages for

use as a mass-produced armor. The pikemen were professional soldiers and with their rise came the rise of the infantrymen who evolved into the modern warriors of today. To help understand the pikemen's pivotal role in the switch from Medieval to modern warfare, we analyzed topics such as the role of the pikeman in combat, the weapons they would use in battle, and their training and tactics. Unfortunately, due to time constraints, the Pikeman were chosen to be left out of the video-documentary.

Across the globe, there were the Japanese Samurai, who complemented the European knights in the sense that they were also aristocratic men taking on the role of a mounted warrior. In fact, the Samurai were often referred to as the "Eastern Knight". This armor (accession number 3144) was created in the Edo Period (the 18th and 19th centuries) during Japan's era of peace. Samurai armor in this era was used for more traditional rather than defensive purposes, explaining the armor's apparent lack of metal and surplus of lacquered leather. The design is an imitation of the armors of the Japanese Middle Ages, so topics include a comparison of the Japanese Middle Ages to the Edo Period, as well as an in-depth analysis of the lives of the Samurai, the build and uses of the armor,

and the weapons used with it. These topics aided in painting the picture that was the Samurai in this armor, standing for everything that was Japan and symbolizing great strength and courage.

This video documentary has many applications in education, both from the visitor's point of view and the Higgins Armory Museum's point of view. For the viewer, this video allows them to learn certain details and facts about the armors and their time periods using terms and phrases that are not technical and can be understood by them. The video also provides them with more information regarding each suit and its time period than is given on the small plaques placed near each of the suits. This is important for the visitor because it leaves them satisfied and allows them to leave the museum happy that they have learned something new, which is exactly what visitors hope to gain from a day at the museum.

This ties in with the point of view of the museum as its goal to have happy customers who leave with more knowledge than they came in with. To the museum, the video is an essential learning tool as it compiles facts about some of their more interesting pieces into one, easy-to-access location. The video also helps build the museum's database by adding more video footage, which may be reused in the future for many different educational purposes. Finally, one major, lasting, educational component of this project that is of importance to the Higgins Armory Museum is the discovery that the Samurai armor, which was originally believed to be made of metal under the

lacquered leather, in fact had no metal whatsoever save for the chain over the arms and a small piece in the nose of the mask. This redefined what the museum had initially believed they knew about the armor and was a great success point for the team.

Together, these four armors successfully tell the history of armor as it evolved through the centuries. As is easily noted, what was considered armor in one period was much different than the armor of another. Although old, these armors still hold much prevalence in the modern world as their history helped to define modern warfare as it is, from everything from tactics to the type of armor that is employed today. Also, these armors have revolutionized the modern gaming world with their presence in combat role playing games (to the point where it could be stated that more people today wear a virtual form of Medieval armor than did those who lived in those times). The people who wore these armors were also the ideas behind many types of modern pop culture such as movies, books, and other media. The histories of these armors paint a historical context in which one can learn about the world as it was and, thus, how this world applies to the world of today. With these armors, we can unlock the mysteries of their histories and tell a story that has never before been told in a manner such as this before to be put on display at the Higgins Armory Museum in Worcester, MA.

The Knight

The History of the Knight in Medieval Europe

The Medieval Period has come to be known as the "Middle Ages" and as the "Dark Ages", as these were times filled with war, poor health, and unfair distribution of wealth; this is the period in which the Composite Field Battle Armor from Italy (accession number 2607) came to be. This period in history has been divided into three sub-periods known as The Frankish Period, which lasted from 410-888, The Feudal Period, which lasted from 888-1300, and The National Monarchies, which lasted from 1300-1517. However, it is useful to note that all of these dates are tentative and simply have become the rough benchmarks to define these periods. The Middle Ages were subsequently followed with a time of flourishing "rebirth" that was coined as the Renaissance. For the purposes of defining all that is a knight, which is the type of warrior that would have worn the Composite Field Battle Armor, the Late Medieval Period (specifically the end of the Feudal Period, during the National Monarchies period, and at the beginning of the Renaissance) is the most important. With an understanding of the history of Medieval Europe as it progressed through time, one can understand why the knight came to be, what was expected of him, and how he eventually became obsolete on the battlefield.

The Feudal Period

In regards to the knight, the first major step in Medieval European history that must be understood is the Feudal Period. There was not one single sovereign rule, and land was the basis for all wealth. The wealthy nobles, or the aristocracy, owned all the wealth and their subservient serfs had nothing, instead giving whatever they managed to

obtain to the noble under whom they lived. The knight rose up during this period, working under the nobles as the backbone of the army during times of war. In fact, in many cases, these knights were the aristocracy in ownership of the large manors. The Church also played a big role during this period, both in the lives of the commoners and in the lives of the aristocratic knights, as the knights were also expected to protect the Church.

Eventually, trade between the different western nations, both with themselves and with the eastern nations, grew. This promoted communication and interaction among the European nations, causing feudal properties began to break up and fall apart. This weakness in feudal properties due to trade and a new type of economy allowed sovereign authority to take over. The rise of the Kings and Queens of the European nations would lead to a new era in medieval history. (Chambers, 1858: 205-210)

The National Monarchies

This new era in medieval history was not without its complications. Although sovereign rule was more popular and more of the commoners supported their kings and queens over the aristocracy or the Church, there was still tension between the three institutions. These institutions can be defined as follows: the monarchy, which now had control of the different European nations and most of the support of the commoners due to their laws and actions that protect the commoners, the noble, landed aristocrats with most of the wealth who once controlled their own estates and responded only to themselves, and the Church. The principle opponent of the new royal power, however, was the aristocracy. Despite the newfound power of the monarchies, they found themselves still forced to depend on the aristocracy for protection. Even at this point in medieval history, the knight was still the most coveted, important warrior on the

battlefield. Thus, the monarchy had no choice but to rely on their opponent if they hoped to keep their nation powerful in the eyes of the other monarchies of Europe. (Dahmus, 1968: 347-349)

Thriving Aspects of Late Medieval Europe

Connections between the Western nations and the Orient thrived and trade was prosperous with the growth of the monarchies. However, this almost ended with the invasion of the Ottoman Turks who placed themselves between the Western nations and the Orient on land, taking over control of the main trade routes to Asia in the late 15th and early 16th centuries. The Ottoman Turks posed a large threat and were a hostile power as they would take many of the valuables and goods from those from the West who were going to trade with those from the East. By traveling on land, people from the West risked the chance of not having favorable trading terms by losing many valuables or even being injured or killed by the Ottoman Turks.

In order to maintain their trade with the Orient, ships technology thrived as new types of vessels were created in order to withstand the waters of oceans never before sailed. With these new vessels, people were now able to sail in places that had once previously been far too dangerous. This was proven a success when Vasco da Gama circumnavigated the African coast in 1497 with his ships in an attempt to reach India and the Orient. Possibly the most important event in the growth of trade and the growth of the world occurred in the Late Medieval Period, specifically in the years 1492-1503, in the effort to find a new trade route to India. Christopher Columbus, like any other knowledgeable person of his time, believed the Earth to be round. Thus, he believed that if he were to sail west continuously, he would eventually reach India and the Orient. What Columbus did not realize, however, was just how large the Earth is and that there is

land to the West of Europe. Instead of landing in India, he landed in what are now the Americas, a discovery so amazing that it would change the world as it was known in that time, although the extent of this discovery would not be truly understood by the monarchies until some years after Christopher Columbus' death. Christopher Columbus made many trips back and forth between the new land and the European nations, bringing with him news of a people who wished to learn the European culture, take on Christianity and trade all that was available with the European people. Ultimately, with these new vessels and the new routes that the ships were able to sail, trade was revived and communication between the nations became easier and faster. (Dahmus, 1968: 372-373)

Communication between the Western nations also became quicker and easier with the invention of the printing press during the 1440s. When Gutenberg and Fust first introduced their invention to Europe, books and documents were primarily printed in Latin. However, with the power of the Church more limited than it had been in previous times, and more commoners wanting to have political control, the use of the vernacular language came with a storm. Within the first fifty years of its invention, approximately eight million books were printed, and most of these were printed in the vernacular. This created a new consciousness in the people of their identity as "Spaniards", "Frenchman", "Englishman", "Italians", and so forth, assisting the domination of the nation-state and the monarchies. (Crompton, 2004: 22-24)

The Renaissance

As Europe was growing and thriving both in technology and in communication, times were changing. Europe was finally able to make its way out of the "Dark Ages" that plagued them for so long, entering them into a "rebirth" of Europe back into prosperity and high-culture. This time period has come to be known as the Renaissance.

With growing communication and the new vernacular language, people profusely expressed themselves and their newfound nationalities in a rich array of literature such as letters, diaries, memoirs, commentaries, poems, and so forth. Art as an expression of one's self also flourished during the Renaissance with great names such as Leonardo da Vinci, who created works such as "The Last Supper" and Michelangelo, who painted the ceiling of the Sistine Chapel and sculpted "David". (Cohen, 2001: 1-4, 21, 26; Frazee, 1997, 470-471, 473-474)

During this time, political participation was much sought after by commoners. Thus, voting for positions that would consistently change after a certain amount of time became common, especially in cities. Although there was much growth in all aspects of life, there was still a noticeable difference between the rural societies, which had an economy based strongly in agriculture and land, and the urban societies in which political, administrative and cultural activities grew up around markets and warehouses and a social hierarchy was formed. (Cohen, 2001: 1-4, 21, 26; Frazee, 1997, 470-471, 473-474)

The End of the Knight in Shining Armor

At the onset of the Renaissance, the knight was still found on the battlefield. However, as the Renaissance continued, technology grew, including military technology. This new military technology and the new advances in military tactics and armor led to the end of the knight's importance on the battlefield. However, the knight did not disappear completely, as the joust was still an important cultural event in which the knight was the main participator. Finally, with the increasing support towards the Kings and Queens, the aristocratic knights no longer held much power or say in governmental and local affairs.

The Knight in Shining Armor

What is a knight? The definition of a knight can be stated as "a man of aristocratic standing and probably of noble ancestry, who is capable, if called upon, of equipping himself with a war horse and the arms of a heavy cavalryman, and who has been through certain rituals that make him what he is—who has been 'dubbed' to knighthood" (Keen, 1984: 1-2). Hailing from the medieval period, a knight is the type of warrior who would have been clad in the Late Medieval Field Battle Armor found at the Higgins Armory Museum. Knights considered themselves an elite class of warriors who were all "brothers-in-arms". They fought from horseback and their favorite weapons of choice were most notably the sword and the lance. These warriors emerged during the violent medieval years due to the Kings' need for protection for themselves and their territories, and the cavalry charge technique of the knight made them the most important and coveted soldier on the battlefield. Many knights owned large farming estates known as manors; these knights generally took part in local governments (and in many cases, they were the local government). There were, however, landless knights, as well. These knights either became troubadours, a popular, traveling poet, or they became mercenaries, as the knight's major source of income was the battlefield. In either case, whether the knight was a powerful land owner or a landless mercenary, they all followed their knightly code of conduct known as Chivalry. (Corrick, 2001: 8-10)

How to Become a Knight

The process to becoming a knight was a long and often very arduous ordeal. In order to even be eligible for the role, it was first required that the potential knight-in-training was the son of a current knight. The levels of training that this boy had to undergo can be broken down into periods according to his age. From birth to

approximately four years of age, the boy was raised by his mother, nurse, and other females in his household in proper behavior. Once the boy reached the age of four or five years, he was generally gifted with a small pony with which we was taught how to ride and look after the horse. After the young boy was able to care for and ride the horse, he was sent away from home to live in his lord's castle, where he would become a page. This usually happened around when the child was five to eight years of age. His main duties as a page were to run errands and learn obedience. This was done by waiting to be summoned by someone of higher rank and appearing before the summoner as quickly as possible. The young page was also taught the basics of swordsmanship using a wooden sword, and he was required to learn how to hunt, as hunting would help the child develop the skills necessary to survive in battle. Through all of this, the young page was also expected to learn self-discipline and control. (Corrick, 2001: 29-40)

At the age of fourteen, after proving that he had successfully learned and mastered all of the previous skills, he would become a squire. This graduation of sorts was conducted through a religious ceremony in which he and his parents would walk up the altar bearing lit candles. At the altar, the promoted squire would be presented a sword and belt that had been blessed by the priest. At the end of this ceremony, the squire was now considered a fighting man who would continue his apprenticeship under only one knight. His duties to the knight included dressing and undressing the knight, putting on and cleaning his armor after use, caring for the horses and cleaning their stables, serving meals to his master knight, and offering the knight a glass of spiced wine before bed. He was also expected to continue his training with weapons and in endurance, horsemanship, and hunting in order to fully hone his reflexes. When the knight he trained under was

called to battle, a more experienced squire would also follow his knight there and fight alongside him, learning loyalty, courage, and, over all, chivalry. (Corrick, 2001: 29-40)

At twenty-one years of age, the squire was considered old enough and skilled enough for the honor of becoming a knight. In order to obtain this position, however, he had to demonstrate to an examining knight that he had all of the necessary abilities, including physical strength, courage and weapons skills. In this sense, not all squires became knights. However, although some squires were not accepted because they lacked the necessary skills, most were not accepted because they simply did not have the land or money to become a knight. These lifetime squires generally hired themselves out to knights for services of approximately a year.

After demonstrating all of the necessary qualities, the knight-to-be underwent a ceremony known as 'dubbing', which was generally scheduled for one of the major church holidays as knights were expected to be religious and work under the name of God. In preparation for this ceremony, the knight-to-be would attend confession, cut short his hair in a show of humbling himself, and bathe in order to wash away his sins and impurities. The ceremony would then begin the following morning with a church service. Immediately after the church service, the knights buckled onto each candidate his sword, followed by an accolade that was completed by the most senior knight present at the ceremony. Upon receiving accolade, the knights generally received a gift of a warhorse. Some squires were also able to receive the accolade on the battlefield after showing great courage and loyalty after a battle; in this way, many of those poor squires hoped to become knights. (Corrick, 2001: 29-40)

Chivalry: The Knightly Code of Conduct

Knights were horsemen who owned and governed the land and their rank of nobility was often a matter of birth, wealth and lifestyle. In response, knights offered complete loyalty to their lords and kings and did their lords' and kings' bidding. Knights were also meant to protect the Church and the Church's clerics and commoners, as they received much of their assistance through the Church. All of this loyalty was established and performed through Chivalry, which was both a class in society and a code of conduct which the elite followed. (Rogers, 2007: 3-8; Brooks, 2000: 48-49; Corrick, 2001: 32-36; Keen, 1984: 1-17)

Chivalry, which comes from the French word for horse, was a way of life in which the military, the noble and the religious combined. By the middle of the thirteenth century, chivalry was already well established in the manuals of knighthood. It laid out the rules for how knights were to behave to other nobles, both on and off of the battlefield, and both men and women nobles. However, this chivalrous behavior was never extended towards serfs, peasants, or townspeople. This code of conduct specified that some of the main qualities a knight must have are: loyalty, courage, obedience, religious devotion, and justness. However, most knights fell short of achieving the level of the ideal knight as many were hungry for power and land. As was previously stated, three main aspects came together to form the chivalry of the knight: military, noble and religious, and one could not be without the other. How the knight was to act was determined and influenced by the members of each area. (Rogers, 2007: 3-8; Brooks, 2000: 48-49; Corrick, 2001: 32-36; Keen, 1984: 1-17)

The Knight on the Battlefield

At their peak moment, knights were the most important warriors on the battlefield; their cavalry charge technique was the backbone of medieval tactics and their warhorse, weapons and armor being the most technologically advanced equipment on the battlefield. The knights, under the code of conduct of chivalry, were meant to fight until the very end of the battle, or until their lord or king called a retreat. In this sense, many well-trained knights often became the lifeblood of their land and kingdoms. However, due to the noble blood of all of the knights, knights on the battlefield generally took very good care not to kill one another, even if they were enemies on the battlefield. This generally meant that non-combatants were usually in more danger than the knights. In fact, most knights, instead of killing the other knights and enemies, would take them hostage and charge a ransom for their release in order to gain more money. Also, in most battles, many knights would seemingly forget all of their technical military training and would resort to their initial training in wrestling as the knights became considerably more exhausted by the weight of their armor as the battle wore on. Finally, not every knight fought in every battle for their lord. Lords generally had a rotation system for the knights in which some would go out to battle and others would stay in the castle. (Keen, 1984: 219-237; Corrick, 2001: 8-12; Rogers, 2007: 7)

The Knight's Opponents on the Battlefield

Eventually, the knight on the battlefield became obsolete as new weapons technologies were created and as new military tactics were implemented. In many cases, the knights were simply too headstrong and didn't want to adapt to the new technologies. In this case, commoners who used the new technology to fight were cheaper and far more efficient for use on the battlefield. Some of the knight's opponents on the battlefield

included: pikemen, gunners, archers and infantrymen. The pikemen had the advantage of the long-range pike, which was essentially just an eighteen foot spear, and their porcupine defense which no cavalrymen could get through. The gunners had the advantage of their explosive guns and the cooperation of the other new warriors on the battlefield. The archers, who were the first to threaten the knights on the battlefield, had the advantage of being able to hide behind somewhere far away from the action of the battlefield, and their longbows and crossbows were able to pierce the armor of the knights, though some of the plate armor was more difficult to pierce. Finally, the last part of the equation made its way in, truly making the knights obsolete—the Swiss formation, a military tactic that is still, to this day, studied. (Corrick, 2001: 79-80; Brooks, 2000: 60-61; Bradbury, 1985: 1-16)

This Swiss formation was compact and better priced than a knight. This formation consisted of the use of an infantry unit consisting of nine men—three pikemen, three gunners, and three archers. In this formation, the pikemen would hold off the cavalry nights while the gunners and archers would kill the horses and the knights from a distance. The infantrymen also did not suffer from the weight limits of the armor that the knights suffered from. It was through the infantrymen that the knights became obsolete and were no longer the most important warriors on the battlefield. It was, also, in this way that chivalry adapted to the new military tactics, transforming from the classic chivalry of the knights. (Corrick, 2001: 79-80; Brooks, 2000: 60-61; Bradbury, 1985: 1-16)

However, the knights would always remain a lasting influence as even the infantrymen grew to include cavalrymen in their units. The skills and weapons of the knight are still analyzed in many current books, as people are still fascinated by the knight. Furthermore, it is not right to think that the knight is a useless warrior, due to the fact that the knight held the rank of the most important warrior on the battlefield for centuries, and the knight's armor and weapons were considered the best of the best throughout these centuries of use and for some time after.

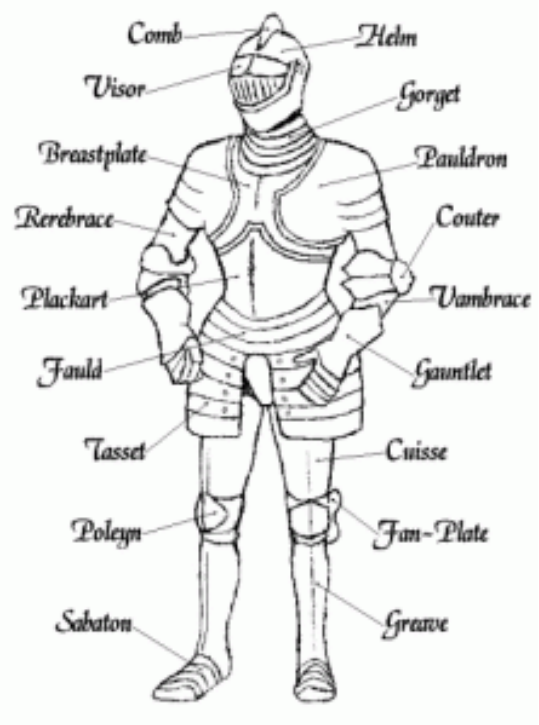
The Armor of the Knights

Plates of metal have been used since ancient times as armor, a good example of this being the Greek Breastplate. In the middle of the fourteenth century, plate armor began to dominate the armor industry. This was partially due to the fact that the expensive price tag on the armor gave owners a certain status of wealth.

By the late fifteenth century and early sixteenth century, the plate armor of the knights had been perfected and was being well-made in two, distinct styles: the Italian and the German. The Composite Field Battle Armor (accession number 2607) found in the Higgins Armory Museum was one of the later made armors, as it was created between 1440 and 1505. This armor, shown to the right, is a composite, air-cooled armor made of steel. This means that its many, original pieces stemmed from different armors and have been put together into one. It also has some modern restorations. (DeVries, 1992: 75-85)

The Parts of a Suit of Armor

A suit of armor consists of many separate pieces of plate armor that have been put together into one. Under the armor, the knight would wear an arming doublet. Chain mail was attached to the arming doublet in places on the knight that were not well protected by the plate armor, such as the joints of the armor where the pieces met one another. It is also through the arming doublet that the pieces of plate armor were attached to the knight and stayed in place. The arming doublet, in combination with all these other tasks, was also created so that the knight's skin did not chafe against the hard metal. From head to toe, the following is a list of all of the pieces that could be found in a suit of armor. On his head, the knight wore a helmet that had a small slit where the eyes were so that he could see. This was meant to protect the knight from his enemy stabbing him in the eyes with a sword or dagger. Next, there was a piece of plate that was designed specifically to go around the neck and the chin. This is called a gorget; however, this was often the least used as it could tend to hinder the knight, thus leading to the continued use of the chain mail coifs in many situations. (DeVries, 1992: 75-85)



The next section of plate armor was the breastplate. This was the piece of plate armor that evolved the most throughout the years. Eventually, it became two main pieces that connected together: the back plate and the front plate. This covered the entire chest and stomach. On top of the front breastplate, near the shoulders, were generally two besagews, one on either side. These were small, cup-shaped plates which had a spike

protruding from their middle. To cover the waist and hips, there was a metallic hoop skirt called a fauld, or tonlet. This plate skirt, which at one point attached to the breastplate but then was redesigned to be on its own, usually had a chain mail skirt under it for added protection between the legs. The knight's arms were covered by a bracer, the elbows covered by a plate known as a couter, and the hands were covered by gauntlets. These gauntlets were designed to look like hands and consisted of many small pieces of plate to give added flexibility. In order to better understand how flexibility for the fingers was achieved, please refer to the picture on the left. As can be seen, the fingers are a series of small, rounded plates overlapping one another. This allows them to slide against each other and bend much in the same way a finger bends. (DeVries, 1992: 75-85; Norman, 1964: 19-38)

On the thighs, knights wore pieces called cuisses. These were formed into the shape of a human thigh in order to provide comfort to the knight and ease when moving. On the lower legs, or shins, the knights wore another fitting piece of plate that was named a jamber, and between the cuisse and the jamber, there was a kneeplate, or poleyn. The poleyn was the earliest piece of plate armor to be used by the knights on the battlefield. Finally, the knights had one, last piece of plate armor. These were the sabatons, which covered the foot. They were designed in much of the same way as the gauntlets, with many little pieces of plate overlapping one another in order to allow flexibility, as can be seen in the picture on the right.

They also usually had a signature point at the end in order to model the fashion of the time and make the armor more appealing. However, these could become very uncomfortable, especially after a long day on the battlefield. Thus, many times, knights chose to forgo the sabatons, much in the same way as they forwent the gorget, and wear a much more comfortable leather or mail shoe in its place. (DeVries, 1992: 75-85)

It is however, important to note that knights did not get dressed in their armor from head to toe. There was a different, more systematic approach for doing this that is very well described by the following primary source:

> **How a man shall be armed at his ease when he shall fight on foot**
>
> He shall have no shirt upon him, but a doublet of fustian lined with satin, cut full of holes. The doublet must be strongly bound where the points must be set about the great part of the arm and the b[rea]st before and behind; and the gussets of mail must be sewn unto the doublet in the bend of the arm. And under the arm the arming points must be made of fine twine such as men make strings for crossbows, and they must be trussed small and pointed as points. Also they must be waxed with cordwainer‘s wax, and then they will neither stretch nor break. Also a pair of hose of single-layer woolen cloth and a pair of short bulwarks of thin blanket to put about his knees for chafing of his leg-harness. Also a pair of shoes of thick cordovan, and they must be fretted with small whipcord, three knots upon a cord, and three cords must be sewn fast unto the heel of the shoe, and fine cords in the middle of the sole of the same shoe, and that there be between the frets of the heel and the frets of the middle of the shoe the space of three fingers.

This first part of the primary source describes the arming doublet that is under the knight's plate armor, as well as other pieces of cloth and where they go. This is to help understand how the plate armor was adjusted so that the knight would be comfortable and at ease. This was an essential asset of the design of the plate armor, as it would prevent injury from the armor. The second part of the primary source document, shown below, describes the order in which a knight would put on their plate armor and ready themselves for battle.

> **To arm a man**
>
> First ye must set on sabatons and tie them upon the shoe with small points that will break. And then greaves and then cuisses and then the breech of mail. And then tonlets. And then breast, and then vambrace, and then rerebrace, and then gloves. And then hang his dagger upon his right side. And then his short sword upon the left side in a round ring all naked to pull it out lightly. And then put his coat upon his back. And then his basinet pinned upon two great staples before the breast with a double buckle behind upon the back to make the basinet sit right. And then his long sword in his hand. And then his banner in his hand painted with Saint George and with Our Lady to bless him with as he goeth toward the field and in the field. (Instructions for arming a knight for dueling and jousting, c. 1475)

The Styles and Metallurgy of Plate Armor

There were two main styles of armor in this period—Italian and German. However, for the purposes of defining the Late Medieval Composite Field Battle Armor that can be found in the Higgins Armory Museum, it is most important to focus on that

which is Italian, due to the fact that many of the original pieces that belong to the armor hail from Italy, despite the fact that the style is predominantly German.

The first step in the making of armor is forging. The full suit of armor first came to be in Lombardy in Italy in the 14th century. Lombardy was one of the major economic centers of Europe, and had some of the largest metal production. There were two main families who created armor in this area—Breschia and Missaglia. The Breschia, however, tended to make more mass-production armors and fewer high-quality, original pieces. The Missaglia, on the other hand, have come to be known as some of the greatest armorers of the 15th century, who exploited the mines and constructed the furnaces for smelting and basically dominated the art of armor making. However, during the first quarter of the 16th century, they gradually sold off everything in relation to the making of armor to a new family, who, through their ambitious nature, have also come to be known as some of the greatest armorers of all time. This family was the Barini, who have come to be called Negroli. Their works for Kings and Emperors were the pinnacle of 16th century armor-making. To better understand the scope of the Composite Field Battle Armor (accession number 2607), it is useful to note that some of the original pieces of this armor were designed and fabricated by the Negroli family. (Williams, 2002: 53-58)

Though the main features of the design of the full suit of plate armor remained constant, there were differences in its form and decoration throughout its history. The greatest differences, however, can be noted in the type of material that was used to create the armors as time went on. The first material used was generally iron, followed by a low-carbon steel and then a medium-carbon steel. Though iron was initially used, it is important to note that steel was the most commonly used material in creating the armors.

In the making of the armor, the armorer also had a choice in what type of heat treatment would be used. The first was known as Hardened and it consisted of fully quenching steel so that it had a completely martensite properties and structures. The next was Attempted-Hardening in which the steel was not fully quenched. This caused the armor to retain all of the following structural properties: fine pearlite, nodular pearlite, bainite, and martensite. The final was simply allowing the armor to air-cool after it was forged. (Williams, 2002: 60-68)

However, this was not the final thing that the armorers had to do in making their armors. Clients who purchased the suits required that some sort of guarantee of the armor's protective capacity. In order to complete this "Proof of Armor", the armorer would use the weapons that were most commonly used during battle and test the armor against them. If there was a dent, but no puncture, the armorer could safely say that the armor that they had created was safe for the user. The types of weapons that were used in proofing were swords, axes, lances, bows, crossbows, and so forth. The crossbow, however, was the most commonly used during proofing. An example of an armor that has been proofed can be seen on the left. The dent on the upper left of the breastplate shows that the armor has been tested against a weapon and that the weapon was not able to pierce that armor, proving its capability and safety for the battlefield. (Ffoulkes, 2008: 62)

Finally, there was one final part in the making of armor. From the 15th century until the time when armor was no longer used, decorating the armor through engraving

was a common thing, especially for those armors that were meant for the rich. It gained its most popularity in the 16th century. The engraving of the armor was accomplished one of two ways. It was either done by burin, or it was done by etching with acid. In either instance, both were done with an extreme intricacy. Most of the time, these engravings were blackened or oxidized so that they were clear to all who saw it. This was to provoke a feeling of complete appreciation from the viewers of the armor for the armorer. In decoration, gilding and gold inlay were also popular; however, this never came to be used to the extent that can be seen in Oriental weapons. (Ffoulkes, 2008: 73-75)

Arms of the Medieval Knight

Although the knight's armor was the most technologically advanced of his times, the knight still required a set of arms if he hoped to defeat the enemy. The knight had many different weapons that would go into battle with him, although he favored some over others. Some of these more favored weapons include the sword, the lance, the axe, and the warhorse. Other weapons that were sometimes used on the battlefield include the mace, the dagger, and the warhammer. With all of these weapons, as a page and squire, he was trained in the proper ways of using them in battle, building a skill set of arms that he would be able to choose from when he became a knight.

The Sword

The sword was the most common, and most celebrated, of the knight's weapons. It demonstrated that the knight had a role of leadership and was used in many ceremonial events, such as dubbing. The most commonly used sword was the broadsword. This sword was 30 inches long, and only three pounds. It was a versatile weapon that was mainly used to cut, slice or thrust at the enemy. This sword, like all other swords, had a

hilt as a handle that was generally made of wood and covered in cloth. Between the hilt and the blade, there was a guard. The purpose of this guard was to prevent the knight's hands from sliding upwards onto the blade and getting cut. (Corrick, 2001: 19-22; DeVries, 1992: 20-25; Edge, 1996: 124-125; Oakeshott, 1964: 56-79)

Originally, relatively short swords were generally used on the battlefield. As plate armor became stronger, the swords had to become longer and stiffer so that they could be used for thrusting and stabbing, allowing the knights to get into the little spaces in their enemy's armor, such as their eye slit or under their arms. Eventually, a cut and thrust variety of sword came to be. These hand and a half swords ranged from 28 to 40 inches in length, and were very versatile, allowing the knights to use any sort of motion that they wished to make with the sword. An example of one of these swords from the 15th and 16th centuries from the Higgins Armory Collection is show on the left. In the 15th and 16th centuries, the most commonly used swords were the broad blade types (which were commonly hand and a half swords), and these would have been the types of sword that the knight clad in the Composite Field Battle Armor from Higgins Armory Museum would have used in battle. (Corrick, 2001: 19-22; DeVries, 1992: 20-25; Edge, 1996: 124-125; Oakeshott, 1964: 56-79)

The Lance

The lance was a deadly weapon when used correctly. It was propelled with the force of the warhorse and the knight, and it could pierce both shields and plate armor, alike. Many times, death resulted instantly from this blow. This type of combat is

known as Mounted Shock Combat, which rightfully describes the shocking blow that the enemy received when hit by the lance. A description of this combat from "The Song of Roland" is shown below:

> He breaks his shield and bursts open his hauberk, cuts through his bones, and tears away the whole spine from his back; with his lance, he casts out his soul; he thrusts it well home and causes his body to swing back and hurls him dead from his horse a full lance-length away. (DeVries, 1992: 12; "The Song of Roland")

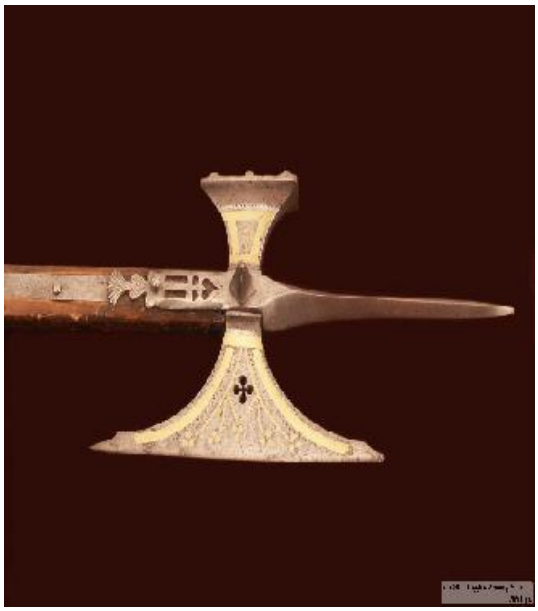
This description, though clearly exaggerated, shows the devastating impression that the lance left on the enemies of the knight on the battlefield. It is said that the lance was so devastating, in fact, that it caused many to retreat from the battlefield upon its arrival. (Corrick, 2001: 22-23; DeVries, 1992: 9-15)

The lance was basically a long, tapered spear. An example of a lance is shown to the right. It was an impressive twelve feet in length and generally made of wood, usually ash or pine. At the end of the lance, there was a sharp metal head. The lance also sported a guard, much like the swords, to protect the knight who was wielding the lance from harm. However, the lance ran the risk of breaking due to bowing if it was not properly used. Also, due to the fact that it tended to get stuck inside of the victim and time could not be wasted pulling it out, the knights generally had to have an arsenal of extra weapons at their disposal. (Corrick, 2001: 22-23; DeVries, 1992: 9-15)

The Shield and Other Weapons

The shield was only used in the early stages of the knight's history. It was used by the knight as a form of protection from their enemies. Consisting of a wooden body with a layer of canvas followed by a layer of leather stretched over it, the inside of the shield housed two straps and padding for the forearm, along with a grip for the knight's

hand. In this way, the knights were able to easily wield the shield and move it with only one arm, allowing their other hand to wield a weapon. However, by the 15th century, the shield became unnecessary due to the advances in plate armor, and most knights ceased to use it in battle. (Corrick, 001: 9, 23-24; DeVries, 1992: 16-20, 5-32; Edge, 1996: 121, 127-128)



Another weapon commonly used by the knights on the battlefield was the axe. This weapon was a type of cutting weapon wielded by one hand that could shatter mail and slice through plate armor. A two handed version was the battleaxe, one version of which was the pollaxe which had an axe blade (or sometimes a hammer head or a spear tip) on one side and a spike tip on the other. The head of a pollaxe from the 1400s can be seen on the right. Next, there was the mace. The mace was a club that weighed from two to five pounds. While the handle was made of wood, the rest was made entirely of iron and steel. At approximately a length of two feet, this weapon also donned a disk to protect the knight's hand and was used to crush through the plate armor. (Corrick, 2001: 9, 23-24; DeVries, 1992: 16-20, 5-32; Edge, 1996: 121, 127-128)

Warhammers, although generally not common, were another weapon used by the knights on the battlefield. They were the same length as the mace and generally accomplished the same goal, crushing and piercing through the plate. However, the warhammer was

different in that its tip consisted of a square hammer on one side and a short, slightly curved pick on the other. This is modeled by the picture of a warhammer from the 15th century that can be seen above. This made the warhammer appear like a smaller version of the pollaxe with different results. In fact, the warhammer is to the axe as the pollaxe is to the battleaxe. Finally, the knight had one last weapon that they used on the battlefield—the dagger. The dagger was a very short blade, mainly used in hand-to-hand combat. Thus, it was generally a last resort and was not used unless the knight found himself facing his opponent on foot in close range. (Corrick, 2001: 9, 23-24; DeVries, 1992: 16-20, 5-32; Edge, 1996: 121, 127-128)

The Warhorse

A knight, as a cavalryman, was nothing without his warhorse. The warhorse was so important for the knight that, as a young child, he was gifted a pony to look after and raise, and, upon becoming a knight, was gifted a new horse for his accomplishments. Warhorses were picked very carefully as they had to possess courage, strength and endurance, charging into a battlefield without any hesitation. These horses were very well trained, and they would stick with their knightly masters until the very end. Many of these warhorses died on the battlefield because they were generally much easier targets for the opponent than the knights who were riding them. (Corrick, 2001: 24-26)

The warhorse was usually a destrier, or charger. Over five feet high at the shoulder and weighing 1500-2000 pounds, the warhorse was incredibly strong. This was important as the horse had to support the weight of his own armor and the weight of the knight in armor with weapons, while charging at full speed. The more well-trained warhorses were even able to go up onto their hind hooves and strike the opponent with their front hooves. For these horses, the knights usually equipped them with cleats on their front hooves, making the blow even more crushing and devastating. (Corrick, 2001: 24-26)

The warhorses were equipped with their own set of plate armor and mail. This usually only covered the tops of the horses, however, leaving their undersides completely vulnerable to attacks. The saddle on the warhorse was made from wood, as well as many other materials such as leather and metal, and the back of the saddle was raised to prevent the knight from sliding off or being pushed off after being hit by an opponent's weapon. The stirrups were so low that the knight's legs were generally straight, appearing as if they were standing on the horse instead of sitting. This added to the force of each blow the knight gave to the opponent with his lance. (Corrick, 2001: 24-26)

The Joust

History of Tournaments

Tournaments and military exercises have been around as long as war itself. Ancient Spartans and Romans used to train their young from an early age in the arts of combat. Tournaments are believed to have originated from these practices as a continuation of the military exercise tradition. It unclear when the first tournament was held but there are dates that go as far back as 842 AD. (Barber and Barker, pg. 13)

Of course tournaments back then were quite different from the tournaments of the medieval times. For example, Virgil's *Aenid* describes a game where riders "first galloped apart in equal detachments, then in half-sections of three broke ranks and deployed their band as in a dance; and then, at another order, they turned about and charged with lances couched. Next they entered upon other figures too, and reversed these figures, with rank facing rank across a space between; and they rode right and left in intertwining circles. And they began a pretence of armed battle, sometimes exposing their backs in flight and sometimes turning their spear-points for attack. Then they made peace again and rode along in an even line" These "tournaments" involved no actual combat but were labeled as such because they were military exercises being held for entertainment and competition in nature. (Barber and Barker, pg. 13-14)

By the eleventh century, however, these tournaments had evolved, somewhere around northern France. At this time, the tactic of horsemen used couched lances had been introduced in battle. Before this new tactic, lances were held either over-arm, under-arm, or thrown as javelins. Using this tactic, horsemen were able to wield heavier lances for more damage while maintaining better control over the lance than previous methods.

These benefits helped the Franks on the First Crusade as well as the conquests of the Normans. However, this new method required training and practice. Also, as this was largely effective when performed by a group of knights in unison, there was a need for team training and exercises. Hence, tournaments started incorporating these factors. (Barber and Barker, pg. 14)

The games of this time were generally melees held over several miles through woods, rivers, farms, and anything else in the way. These obstacles were useful for planning ambushes and warfare tactics. There were no official marked boundaries at the time, and were generally held in the area between two or more towns. The only limits at the time were designated refuges for knights to rest and rearm themselves safely. Although the point of the game was strictly to capture the opponents, since there were so many knights and simultaneous fights going on, there was no real way to enforce this. There were many instances in which participants were attacked despite losing parts of their armors and all possible weapons were deemed acceptable. Therefore, as one can imagine, there were large accounts of injuries and casualties. The only difference between these tournaments and real battles were that they were not aiming to kill. (Barber and Barker, pg. 14-15)

Official "tournaments" were said to be invented by Geoffrey de Preuilly around the mid-11th century. Geoffrey de Preuilly was killed at Angers along with other barons and all records of Geoffrey de Preuilly fail to mention tournaments of any kind so this statement that he had invented tournaments is without any stable foundation. However, by the turn of the 12th century, there was an increase in tournament references. (Barber and Barker, pg. 15)

Many believe that Anna Comnene, a Byzantine princess, makes references to tournaments in her *Alexiad*. "I am a pure Frank and of noble birth. One thing I know: at a crossroads in the country where I was born is an ancient shrine; to this anyone who wishes to engage in single combat goes, prepared to fight; there he prays to God for help and there he stays awaiting the man who will dare to answer his challenge. At that crossroads I myself have spent time, waiting and longing for the man who would fight – but there was never one who dared." This was a speech that a French knight on the First Crusade said to challenge the Emperor in Anna Comnena's *Alexiad*. (Barber and Barker, pg. 15-16)

Although there is no direct mention of tournaments in this speech, many believe that this was a reference to tournaments based on references to crossroads, the challenge, and the chance encounter. These were elements of tournaments and chivalric knights. There is also separate evidence that supports the idea that these were references to tournaments. For one, it was said that in the crusaders would spend their leisure times running at the "quintain" which was a popular tournament exercise. Although the First Crusade was mostly made up of Franks, there were a number of other Europeans who had volunteered. It is very possible that the French recruits demonstrated and showed their new tournament sports to the rest of the crusaders. (Barber and Barker, pg. 16)

Not all evidence of early tournaments were found in chronicles and stories, but a rather large amount of evidence came from charters and written laws. There were many cases of documented rules and regulations being created and enforced in efforts to control the tournaments and keep the violence from getting out of hand. Although tournaments were mostly fought by knights and watched by nobles, in the early days many townsmen

would also watch and/or compete as the knights' foot soldiers. (Barber and Barker, pg. 16)

In 1125-1150, it was said Osbert of Ardern gave Turchill Fundus a large land for him to carry Osbert's painted lances on his travels whenever he received a legal summons or chose to go overseas to tourney. Around the same time of 1125-1130, it is believed that tournaments had spread outside of France, as there was a sudden increase of evidence of tournaments found in other countries. For example, it was said that Count Charles the Good of Flanders "frequented tournaments in Normandy and France, and outside that kingdom too, and so kept exercised in time of peace and extended thereby his fame and glory and that of his country." It was also said that the knights of Nuremberg engaged "in military exercise now commonly called a tournament" shortly after 1127. (Barber and Barker, pg. 16)

The church had finally taken note of these tournaments in 1130. By this time the popularity of tournaments had spread so much that the church condemned the tournaments and its participants. This was all in the church's effort to minimize and control violence. They started movements to limit the activity and protect non-combatants. They also prohibited fighting during weekdays and feast days. "At the Council of Clermont in 1130 the ninth canon issued stated that 'we firmly prohibit those detestable markets or fairs at which knights are accustomed to meet to show off their strength and their boldness and at which the deaths of men and dangers to the soul often occur. But if anyone is killed there, even if he demands and is not denied penance and viaticum, ecclesiastical burial shall be withheld from him'." (Barber and Barker, pg. 16-17)

Geoffrey of Monmouth wrote *History of the Kings of Britain*, in which he talks about King Arthur's plenary court at Whitsun. "By this time, Britain had reached such a standard of sophistication that it excelled all other kingdoms in its general affluence, the richness of its decorations and the courteous behavior of all its inhabitants. Every knight in the country who was in an way famed for his bravery wore livery and arms showing his own distinctive colour; and women of fashion often displayed the same colours. They scorned to give their love to any man who had not proved himself three times in battle… Invigorated by the food and drink they had consumed, they went out into the meadows outside the city and split up into groups ready to play various games. The knights planned an imitation battle and competed together on horseback while their womenfolk watched from the top of the city walls and aroused them to passionate excitement by their flirtatious behavior. The others passed what remained of the day in shooting with bows and arrows, huring the lance, tossing heavy stones and rocks, playing dice and an immense variety of other games… Whosoever won his particular game was then rewarded by Arthur with an immense prize." (Barber and Barker, pg. 17-18)

Although the Geoffrey of Monmouth's story was semi-fictitious, he was first to make note of or introduced two very important additions to the tournaments of the time: the introduction of ladies and personal heraldry. There is a good chance that he foreshadowed these ideas because there is no historical evidence of women attending these tournaments for another fifty years and shields were generally used for groups rather than individuals at this time. The final major addition to these tournaments was the introduction of the *joust*. The first known joust held in a tournament was "the prelude to

battle", between King Stephen's men and the knights of Robert, earl of Gloucester. (Barber and Barker, pg. 17-18)

History of the Joust

By the early twelfth century, tournaments (including joust) had rapidly become much more popular, even amongst commoners. Times were changing in Europe, and so tournaments inevitably changed with them. What used to be battles fought out of loyalty and respect for the lords had someday been changed to tournaments in which the knights would now battle for fame, love, and lust. Tournaments now had a mark of chivalry attached to it and were events in which heroes could win over speculating women through their display of strength and courage. There were great stories and literature on the heroes of tournaments and their journeys, and these stories in turn, helped make tournaments even more popular as they were major parts of the heroes' lives. (Barber and Barker, pg. 18-20)

Many participants of these tournaments were young and recently knighted sons of nobles, who were sent to study knighthood. Therefore, an apprenticeship system was formed, where these young men would spend some time as a chivalrous apprentice on tournament circuits in Northern France. (Barber and Barker, pg. 21)

Henry, count of Champagne and Philip, count of Flanders were patrons of the tournament and they as well as their families, whom were also very powerful and rich, were very into the tournaments. The backing of these powerful patrons helped the immense growth of tournaments in the late twelfth century. It was said in the chronicles of Arnold of Ardres and William Marshal that tournaments were held every fortnight at the time. (Barber and Barker, pg. 20-21)

William Marshal was a knight who although came from a relatively humble family, excelled in tournaments, attracted the attention of royalty and nobles, and thus became a legend in the world of tournaments. Although he was sought after by many patrons and very tempting offers, including Philip of Flanders, he remained loyal to the Young King Henry, All his success caused him to take a very business-like approach, as his objective became to win as many prizes and ransoms as possible. He eventually teamed with another knight in King Henry's household and they fought tournaments together dividing up their winnings. It is noted that in a span of ten months, they had won one hundred and three knights, along with their possessions. They were able to gain great wealth while improving their reputation in tournaments. In the romance *Erec et Enide,* Chretien de Troyes writes about a tournament in Tenebroc. (Barber and Barker, pg. 21-22)

> A month after Pentecost the tournament assembles and opens in the plain below Tenebroc. Many a pennon flew there, vermilion, blue and white, and many a wimple and sleeve that had been given as tokens of love. Many a lance was carried there, painted in silver and red, others in gold and blue, and many more of different kinds, some banded and some spotted… The field is completely covered with arms. The ranks shudder on both sides, and from the clash there rises a loud din, with a great cracking of lances. Lances break and shields are holed, the hauberks are torn and rent, saddles are emptied and riders tumble, whilst the horses sweat and lather. All draw their swords on those who clatter to the ground. Some rush up to accept their surrender, others in their defence.

> Astride a white horse, Erec came to the front of the rank quite alone to joust, if he could find an opponent. From the other side the Haughty Knight of the Heath spurs against him, mounted on an Irish horse that carries him along at furious pace. Erec strikes him on the shield protecting his breast with such force that he knocks him off his steed; then leaves him on the field and spurs on… All those who saw this joust were quite amazed and said that anyone who pits himself against so good a knight has to pay too high a price.
>
> Erec's main concern was not with capturing horses or riders, but to joust and do well so as to show off his prowess. He makes the ranks in front of him tremble, his valour putting new heart into those who were on his side. To discourage his opponents all the more, he did take some horses and riders. (Barber and Barker, pg. 22)

In this story, the protagonist, Erec, was made out to seem as though he had won the tournaments by himself, which was never the case. Chretien also writes of love tokens and fighting for acclamation and reputation without care for materials. This was hardly the case with William Marshal and the other knights. While individual ability and skill were valued, the primary goals of these tournaments were victory for the company and the prizes. So while the literature made the life of a knight seem glorious and prestigious, the actuality at the time was most likely more barbaric and closer to the stories of William Marshal. (Barber and Barker, pg. 22-23)

Jousting gained immense popularity in the early fourteenth century through its appeal of practicing and training with weapons for combat, while limiting the amount of

casualties because there were fewer knights involved. It also appealed to the knights because a combatant's skill was much more easily seen to the spectators. In fact, there were very few old-style tournaments heard of after this sudden increase in jousting popularity. Although jousting had all but completely taken over the world of tournaments at this point, those who enjoyed large scale and dangerous games started a new type of jousting called "jousts of war". (Barber and Barker, pg. 32-34)

The first record of this type of joust occurring was a result of hostilities between England and Scotland. At this time, these were a mix of actual combat on agreed terms and tournament games. In 1341 Henry, earl of Derby, held two border combats. The first, held in Roxburgh had the earl with three companions jousting against William Douglas and his three companions. As an outcome of this, William Douglas was mortally wounded. The second was at Berwick, in which there were twenty English knights jousting against twenty Scots for three days. As an outcome there were three deaths and many casualties. Although these combats were very violent and were born from hostility, the best performers on each side would be awarded prizes at the end of these tournaments. After these tournaments, Long-term jousting festivals became popular. There are records of a fifteen day long jousting festival in London in 1342, three days of jousting in Smithfield in 1343, and in 1344 Henry, earl of Derby initiated an annual tournament trend at Lincoln. In this annual tournament, he would lead a group of knights in jousting matches every year until upon his death, the group would choose his successor. (Barber and Barker, pg. 34)

In 1358, King Edward III held a torch-lit jousting festival at night in Bristol, and a round table at Windsor. The round table lasted three days and the team was led by the

king himself. There were over three hundred knight and three hundred ladies at attendance. This was among the first attempts to create a permanent order of chivalry. In this, the king would invite and persuade the best knights to join his fraternity of knighthood and began building apartments to accommodate his round house at Windsor Castle. The building operations halted after several years but this was still a major step in chivalry. (Barber and Barker, pg. 35)

Under the rule of Edward III, jousts had become exceedingly frequent. They were held at every possible opportunity including royal births, marriages, and other personal triumphs, along with times of political achievements. By the time Richard II's rule had started, indoor jousts had also become popular. Richard II was also fond of jousting as Edward III was, and England would enjoy more years of jousting under his rule. The death of Richard II however, was the end of the "golden age" of tournaments in England, including the joust. (Barber and Barker, pg. 36-37)

History of Germany from the Late 15th to Early 16th Century

The 15th century marked the closing of the middle ages in the Central Europe region, and the emergence of the Modern Age. Germany was changing with new ethnic, cultural, linguistic, social, and political formations. However, there was no center city for this new land to base its new political and economic developments in, as London did for England. However, to the west and south were Italy and France, which were dynamic economic and cultural centers of Europe. Therefore, as a result of the links developed with Northern France and Italy, the cities of Cologne, Nuremberg, and Augsburg started growing and become culturally significant. (Wende, pg. 26-27)

There were a number of events that marked the end of one era and the dawn of a new age in Europe. In 1453, the Ottoman Turks took over Constantinople, which was the capital of the Byzantine Empire, causing many Greek scholars to relocate in Italy. This is believed to have had a giant effect on the Renaissance movement. In 1942, Columbus "discovered" America. All of Europe started travelling to and conquering the rest of the world, trying to get claim any many nations for their motherland as they could. This marked the start of globalization. In 1494, King Charles VIII of France invaded Italy and conquered the Kingdom of Naples. This is often noted as the start of the conflict between France and the Habsburg Empire, which lasted over two centuries, and of modern power politics. In 1517, Martin Luther, a Saxon monk, published works against the practice of the Church selling indulgences. This eventually played a key role in the break-up of Christianity into Catholics and Protestants. (Wende, pg. 30-31)

The Church and the Reformation

The position of the Church in Germany was very different from the rest of Europe. The local rulers had a tight grip ecclesiastical rights and benefits, so much that the Duke of Cleves was reported to have claimed that he was pope in his lands. However, the German Church still collected money through ecclesiastical jurisdiction, dispensations, and other services of the Church. This money was then collected by the Roman Church. This caused resentment as the Pope was soon viewed in Germany not only as the head of a universal Church, but as a foreign power. There were also complaints about the Church abusing its spiritual privileges, and the quality of priests and preachers. However, these complaints represented no danger to the Church. In this time, many lives were miserable and short, and their one hope was the promise of everlasting life, which only the Church could offer. Therefore, this notion of heaven kept the

population from damaging the church in any real way. In fact, as time went on there was an increase in pilgrimages, religious feasts, and pageants. There was also a greater demand of holy books and images of saints. However, the people were becoming more and more discontent with the Church and therefore could be easily convinced with an alternative method of salvation. (Wende, pg. 31-34)

Martin Luther was a monk who protested against the Church selling "indulgences" or "pardons" to people who have sinned for a certain price. He believed that salvation was based solely on belief in God's mercy. He then defended his position by arguing that there was an authority on earth higher than the Church, which he argued was the scripture. He was later excommunicated by the Church, placed under ban in the Holy Roman Empire, and called a heretic by Rome's theologians, but this conflicted had already started a massive movement all throughout Europe, including Germany. This was the start of the Reformation which drastically changed the Church and subsequently all of Europe. (Wende, pg. 34-37)

The Nation

In thirteenth century, towns had started to see a drastic growth in terms of number, size, and status. During the course of the thirteenth century, the number of towns grew ten-fold and many of these towns, although small in size, enjoyed a certain degree of importance and self-government. Some towns were based on Roman foundations, while others grew from the expansion of trade, production, and markets. Western and southern Germany seemed to enjoy a greater level of urbanization as many of their towns had town walls, fortifications, a castle, churches, a town hall, guild halls, and solid houses for the residents. Some towns had a local ruler, while others were free to govern

themselves. However, due to this decentralized political nature, no single town in Germany seemed to emerge as a royal capital comparable to London or Paris. Towns would often join leagues or alliances, in order to stand on their own against princes and lords. In Germany, local princes were responsible for keeping the peace within their territories, but often wages war with other princes and towns within the German Empire. Therefore, there were constant battles and feuds going on, and the Emperor proved too weak to keep the peace. (Fulbrook, pg. 22-25)

The Teutonic Knights were religious knights who, in a crusade against the Slavs, began an establishment in the far north-eastern territories in 1226. For almost two centuries they had expanded and the state of Prussia even beyond the Holy Roman Empire from the river Vistula to the Memel. However, they gradually started to lose power and by the end of the Thirteen Years War (1453-1466), they were defeated. They were forced to accept feudal dependence on Poland and surrendered West Prussia. In 1525, Albrecht von Hohenzollern, Grand Master of the Teutonic Knights, turned Protestant and secularized the Order's remaining land. He became the first German duke of Prussia. (Fulbrook, pg. 25-26)

Between 1200 and 1300, the population rose from about 8 million to about 14 million. The "Black Death" or "Bubonic Plague" in 1348-1350 caused this population to diminish drastically, but by the beginning of the sixteenth century Germany's population rose to about 16 million. This rapid growth in population led to periodic peasants' revolts over land and resources, particularly in the more densely populated regions of south-western Germany. By 1500, the political map of Germany was very complicated, with patchworks of imperial free cities and castles of independent Imperial knights. "There

were seven electoral principalities, around twenty-five major secular principalities and nonety ecclesiastical ones, over a hundred countships, a very large number of lessor lordships, as well as the towns." (Fulbrook, pg. 26-28)

There was also a change in culture and education. Chivalric literature was overshadowed by literature on urban life. Laws were now being codified and there was a difference between German law and the English common law system revived from the Roman law. There were also multiple universities founded in the fourteenth and fifteenth centuries such as the universities of Vienna (1365), Heidelberg (1386), Leipzig (1409), Tübingen (1477), and Wittenberg (1502). There were also growing numbers of new professional bureaucrats, lawyers, and secular scholars. The middle-class man was becoming well educated and well paid, as the social status of the middle-class rose and the power of the Church lessened with the developments of the Reformation. The local prince and the people of the self-governing towns were the political focal point as the monarchy and the emperor were unable to maintain a dominant power over the varied and scattered territories. (pg. 28-32)

The Jouster

The Jouster has changed a great deal over time. In the early 13th century, jousters were almost entirely made up of knights, and would joust for battle training or for festivals and events held for nobles and kings. By the early 15th century many nobles, dukes, counts, and sons of very wealthy families were also taking part in the joust. The joust by knights was still used for training and entertainment for nobility and royalty, but jousting by others was becoming a hobby or sport. By the late 15th century, the middle class joined in the jousting. Jousting was very expensive, and while knights were able to

win armor and equipment or had patrons who would support them, anyone else who wanted to joust had to buy their own. In some places, such as the free-governing town of Nuremburg, the town started lending out armors and equipment for a price. This allowed a more variety of people to joust but it still said a great deal about one's social status and wealth to have a member of the family joust often. Therefore, only the wealthy were able to afford it and it became a distinguishing mark of a wealthy family. Below is an example of a proud father who wrote a note at the end of the family deeds about his son.

"My eldest son Philip's first tournament was at Wiesbaden on October 5, 1410. After that, at Mainz on 18 November, and a week afterwards at Frankfurt, then one at Boppard at Christmas and one at Main the following Easter (1411), and one at Worms a fortnight after Easter. Then one at Würzburg three weeks after Whitsun and one about November 11 at Frankfurt, and one at Landau a fort-night after Easter (1412) and one at Heilbronn and one at Wiesbaden on Shrove Tuesday (1413) and one in November at Boppard and one in November at Worms." (Barber and Barker, pg. 64) The son, Philip, was born in April of 1393 and was only seventeen when he entered his first tournament. This quote shows great insight into how proud the father was and how much he wanted to show, not only his son jousting, but also that he had the means to support his son's jousting so regularly. By this time, jousting had become a recreational sport or activity, and was rarely used for battle training purposes.

There are several different types of joust, by the two used in this section for comparison will be the *Rennen* and *Stechen.* Both forms of joust were developed in the 15th century and used throughout the 16th century. Both were under the category of "jousts of peace" and were fought without the intention to kill and so both used

specialized armor much heavier than regular plate armor used for battle. This was the style of jousting most regularly exercised because at this time, these were not soldiers fighting but rather sons of wealthy merchants and nobles, who only jousted as sport. Therefore, they specialized the armor to be extra thick and protective. The armor used for *Stechen* was called the *Stechzeug.* This armor was in particular very thick and heavy, many times almost completely immobilizing the wearer. These armors could sometimes weight as much as 100 pounds or more, with the only limiting factor being the maximum amount of weight the horse could carry. These jousts were full contact and so the whole upper body including the helmet was protected by thick metal and was extremely heavy. (Jousting in Wikipedia http://en.wikipedia.org/wiki/Jousting)

The *Rennen's* armor, the *Rennzeug* was notably lighter and gave the wearer more mobility and agility than the *Stechzeug*. This form of joust involved lighter contact and its goal was to hit the opponent's shield. The shield was attached to the armor by a mechanism of springs that would automatically detach itself upon contact. The goal of both jousts was to ultimately knock the opponent off their horse, but there was a point system in each tournament. This point system differed from tournament to tournament but would have been along the lines of: 1 point for a blow to the center of the shield, 2 points for a blow to the correct area of the chest (a circular area on the shoulder/chest area that allows extra protection), and 3 points for knocking off the horse. (Jousting http://www.middle-ages.org.uk/jousting.htm). The following picture is an example of a *Stechzeug* armor.

Fig. 1. German Jousting Armor from Higgins Armory Museum

As you can see in the above picture, the lance arm is only protected until the forearm, whereas the left side is covered completely including with gauntlets. Also, as you can see, this armor is only for the upper body. There are holes on the left chest area. These holes may have been for attaching a shield or the circular target protector. On the right side hip, you can see the lance holder. This was used to help the wearer hold the lance in the proper position. The holes slightly above the lance holder are most likely used for adjusting the position of the lance holder. Also, you can see the protection in the front of the arm near the elbow area is unusual. There is a small gap and some armor under it

sticking outward. This is to allow the wearer to assume the proper jousting position and in that position, the armor sticking outward would fully cover the small gap.

Another similarity shared by "jousts of peace" was the lance tips. Lances used a crown-shaped coronal with three stunted points at the tip which helped keep the lances from getting stuck in the armor as well as helped disperse the blow. Lances were made of wood with only the coronals made of metal. This was done to minimize the weight of these lances to make them easier to use. These lances also developed vamplates, small shields in front of the hand grip on the lance to protect from the jouster's hand to forearm. With the appearance of the vamplates, jousting armor started using less protection on the lance side from the hand to the forearm. The circular protection piece on the shoulder/chest area mentioned earlier was also able to be moved from the left side to the right side and vice versa. (Lampe and Berg "Modeling the Joust" IQP Project)

Fig. 2. Coronal Lance Tip and Lance Vamplate from Higgins Armory Museum

The shields used in "jousts of peace" also differed from shields used in actual combat. While in combat, most used a triangular shaped shield, for the joust of peace,

they often used an irregularly shaped shield called the *eranche*. There were also two main types of horses used in these jousts, chargers and destriers. The chargers were medium sized horses raised for speed and agility, whereas destriers were bigger and slower but allowed more force behind each blow. Chargers were generally normal medium sized horses whereas destriers were heavy warhorses. The horses had armor themselves, usually one covering the face, one covering the wearer's leg area in front of the seat, and one covering the horse's chest. (Jousting in Wikipedia http://en.wikipedia.org/wiki/Jousting)

Tournaments and jousting have changed over time and although may not be as popular as it was in its prime, it is still an important part of history. Its changes give insight into the changes of the world and the area around it. Its role of being enjoyed by the kings and nobles while frowned upon by the Church shows the struggle of power between the three. The range of participants going from knights, to nobles, to middle-class, shows the change in economy and social status during the time. The thickening of the armor and protection measures made over time showed the thoughts about war and battles that were changing between when tournaments first started and when tournaments started to die down. They were among the most popular pastimes of the middle ages and renaissance and the changes over time reflect the times in which they were popular.

The Pikeman

Armor: Renaissance Warfare

Battlefield Positions and Infantry Types

Management of men on a battlefield was often the deciding factor in war. Men who are pitted against larger and better equipped forces could still triumph provided they used a better strategy. Keeping infantry in a closely organized formation prevents the chaos of war from shattering morale and scattering the troops across the field. A properly maintained fighting group could decimate a disorganized one.

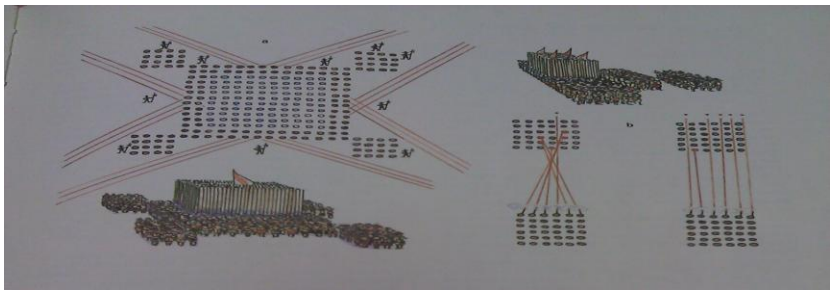
One of the most powerful unit types on the field was the cavalry. The cavalry would ride into battle and fairly easily dispatch any soldiers that were out of formation. The rider having far greater speed than a foot soldier would be able to chase him down. The cavalry wouldn't be able to deal with a large formation of pikes but once the formation was broken apart they would ride in and in the confusion would be less likely to come to any harm.

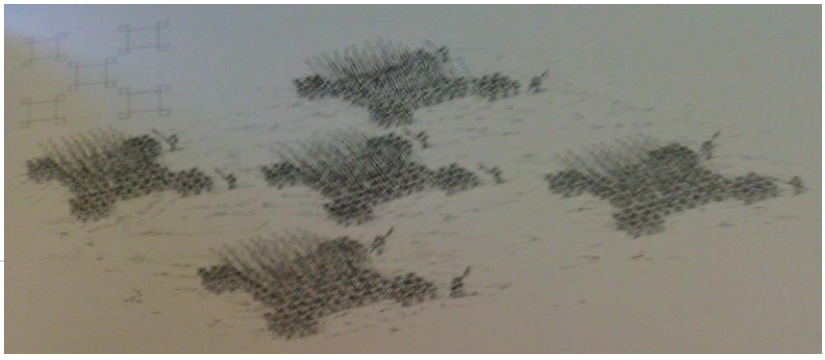
The greatest defense against the cavalry was a formation of pikemen. The pikeman was one of the most common infantry units on the battlefield. In large enough numbers pikemen were capable of defending themselves and other infantry from many of the threats on the battlefield. There was little that an army could do to stop a formation of pikemen if they didn't have ranged weapons.

The best method of offense is to be able to attack first while not allowing an enemy to return the attack. The use of Muskets was one of the major turning points in the story of armored warfare. Before gunpowder there was a greater need to be up wind

of an enemy in order to give archers the best opportunity to attack. Ranged weaponry was mixed into formations of pikemen in order to allow for a safe place to fire from. While reloading these early firearms took significantly longer than knocking an arrow the range and piercing power was more than enough to make them a powerful unit on the battlefield. The weight of the equipment needed to maintain regular combat with these weapons prevented them from wearing heavy plate armor.

The use of mixed infantry created a strong balance of offensive and defensive abilities. When musketeers were threatened by other infantry or cavalry they could retreat into the pike formation where they couldn't be pursued. In this way the musketeers would be able to focus on the dangerous task of loading their weapon without the added fear of being caught off guard by an enemy. The use of a formation called an "Infantry Square with Horns" was composed of a battalion of about 100 pikemen and 160 musketeers. This was arranged in such a manner that the Musketeers could fire from all sides of the formation and be no more than a few steps away from the safety of the pike. The musketeers would rotate through the formation; after the leading edge fired they would move around to the rear and begin to reload as the men behind them would take aim. The symmetry of the formation added to its effectiveness by





allowing it to change direction on command and have the same combativeness against flanking maneuvers.

The Infantry Square was often used with multiple battalions moving in a chequered formation. The wall of muskets and pikes would have been devastating to any enemy that was as close as fifty to seventy five feet. The cross fire from one end to the other of just one battalion would have been hard to survive, but being caught in between two or three would have meant sure death.

Equipment on the field

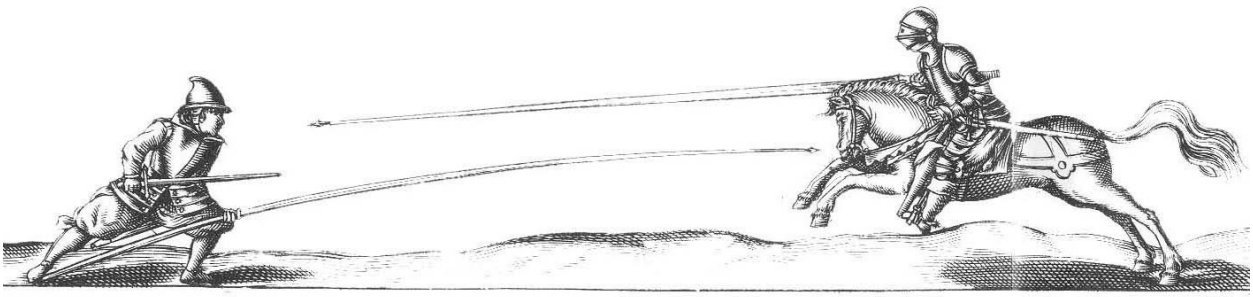
In the Seventeenth century warfare had developed and refined many tools of destruction. The balance of each of these tools was ever changing and battles were often complicated by the introduction of different tactics and strategies. Simply having more equipment did not ensure victory for an army. Understanding the interconnected pros and cons of the equipment at an army's disposal and how best to use them against their opponent was of utmost importance to a battlefield commander.

Canons were heavy, they often required teams of horses to move them, and their rate of fire was slow, but when they were placed well on the battlefield they dispensed carnage among slow moving infantry formations and fixed emplacements. The heavier canons were even capable of breaking down castle walls.

Infantry types varied in numbers but were the backbone of any army. The pikeman defended the musketeers. Each would carry the weapon of their namesake but would additionally carry a sword or dagger in case their weapon was not ready to use or broken. The musketeers would carry several pieces of equipment to prepare their weapon

to fire. There were two types of gunpowder that were needed for firing, the powder kegs needed to be accessible to keep the men from running out. The pikemen wore helmets, breast and back plates with a metal skirt in the front. The musketeers wore only helmets for armor as their weapon and equipment were so heavy. There were on occasion halberdiers who were equipped in much the same fashion as the pikemen.

Cavalry would be used once the enemy lines were broken as pikemen had no problems stopping them with a proper formation. The trained horse was a valuable piece of property and its rider was more likely to be wealthy than his foot soldier counterparts. The armor of a mounted unit depended greatly on the individual's social position. The knight may have more of a full body armor, while more wealthy commoners would more

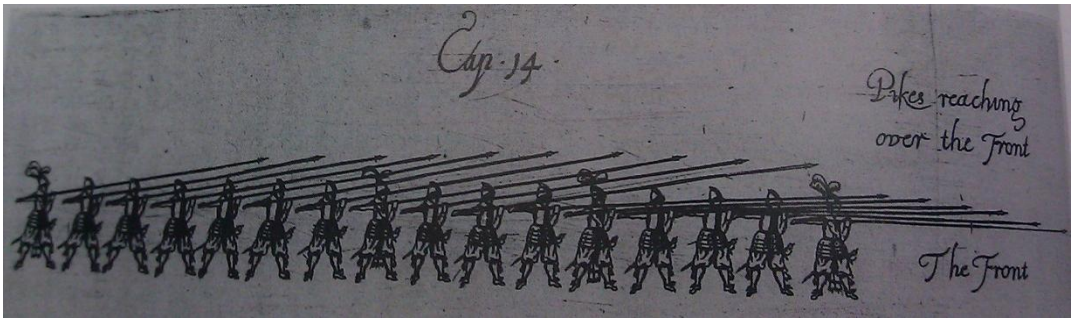


likely be armored in the same fashion as the pikeman.

Opponents Strengths and Weaknesses

The specialization of units in war created a system that balanced offensive and defensive abilities. No one unit was a perfect machine of war. If the unit was fast it likely had little armor or short ranged weapons, if it was armored it was likely slow with medium ranged weapons, and if it had long range it was likely to be unarmored and still slow. It was only with a good balance of units that the inherent weaknesses could be guarded.

The pikemen drew their strength from their numbers. A single pike was little threat to anyone but a formation was a hard nut to crack. With a length of up to twenty



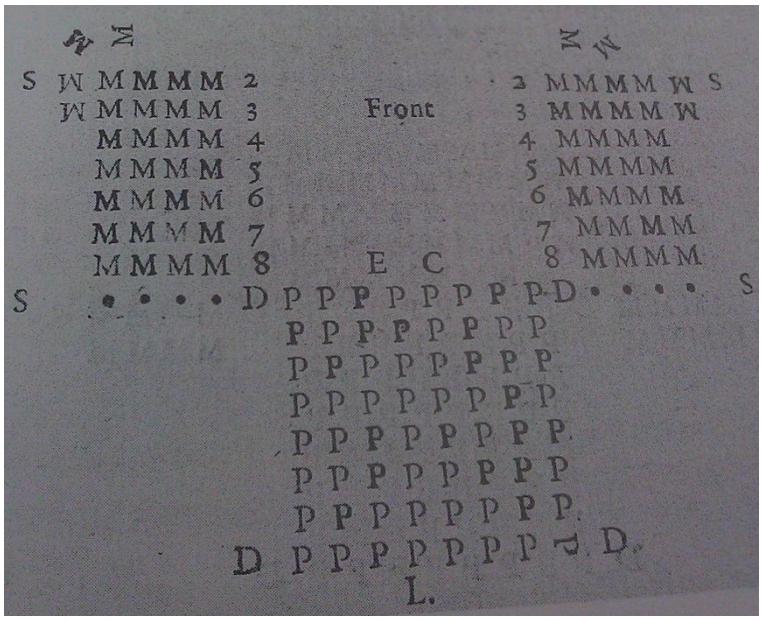
feet, a pike could defend the front of a formation while held by a man standing behind five other men. The pike was held in a way that is similar to a javelin, in one move the weapon could be thrust forward three feet to attack. When held at eye level the distance of the pike's tip would be hard to judge and with a full formation bearing down on a man it would be nearly impossible to avoid impalement. The outer edge of a formation was a veritable cloud of blades eighteen feet thick. The armor of the pikeman offered some protection against gunfire to the head and core of the body.

The formations of pikemen were limited in their movement due to the sheer number of men that needed to be coordinated. If commands were not heard by the whole battalion the formation could be momentarily weakened. With muskets and canons firing and hitting all over the battlefield, hundreds of suits of armor moving in unison, and all of the sounds of war joining together under a steel helmet it is impressive that the formations could be commanded at all. The cavalry only needed a moment of confusion to take advantage of a poorly organized formation and shatter it.

Cavalry rode into battle and were strongest when on the move. The force that their weapons would put out was amplified by their height and speed. Even knocking an

armored horseman over could potentially be fatal to ground troops. Only when the cavalry was slowed was their power diminished. The pike was a most effective way of stopping the advance of the cavalry, keeping them from reaching a range at which they could attack and leaving them at the perfect distance for musket fire. There was a period in which their armor was reinforced to protect the core of the body but the added weight meant removing armor from the arms and lower legs would be necessary.

The Musketeers carried a great deal of equipment to operate their weapons. The loading process for these early weapons was a complicated series of actions that took a significant amount of time and was rather dangerous to complete. Though advances later



in the century would improve the safety, speed of loading, weight, and accuracy, the gunmen in the 1600's would fire their weapons at a rate of as little as 40 times in an hour. The movements of formations were designed to maximize the rate at which they could fire. In some formations the front rank would fire and then retreat to the rear to allow the next rank to fire. In others the use of multiple ranks firing at multiple heights in unison was used to increase the amount of enemies that would fall in a volley in hopes of tripping up the ranks that would fill in from behind them. The

coordination of these formations needed to be performed precisely in order to get the best results.

Ultimately the battles would be determined by the best use of tactics and strategy. Only when the armies had the equipment best suited for the job along with the knowledge of how to best use them could they find themselves victorious.

Warfare Tactics and Strategies

The methods by which each unit on the battlefield is used makes up the strategy, while the selection of what units, in what number, where and when, is called tactics. The individuals on the field are no longer concerned with tactics. The months and weeks leading up to a battle are when the tactics are set in motion. With good tactical planning an army will be prepared to do the most damage to their enemies with the least harm coming to their own men.

The building of an army into a winning force was both an expensive and politically involved undertaking. King Charles I, who had not summoned England's Parliament for eleven years, found that he required new taxes to pay for an army to stop a rebellion in Scotland. Having need of Parliament's approval to implement the tax, Charles knew that he wouldn't get it without negotiations. When the terms were not to his liking he attempted to arrest those who would not capitulate, thus starting the English Civil War. This is an example of a bad military tactic.

Many of the wars that were fought in the seventeenth century were wars of religion, or of revolution. The best tactic to have in war is to avoid it altogether. Employing tolerance and diplomacy are two of the best ways to achieve that tactic.

Having neither of those insights in his repertoire, King Charles I was defeated and executed by the people he once ruled. This can also be considered a poor exit strategy.

Design of the Armor

The Chest Plate

The core of the body houses many organs that are important to keep safe. Any one of these organs when damaged may cause death, whether it is over time or instantly. The breast plate was a piece of elegantly shaped steel, designed to shirk off the majority of the weapons of the era. Often dented by a shot from a musket as proof of its quality, the plate was forged in such a way as to be hard, to resist impact, while remaining springy in order to dissipate the force of a blow without shattering.

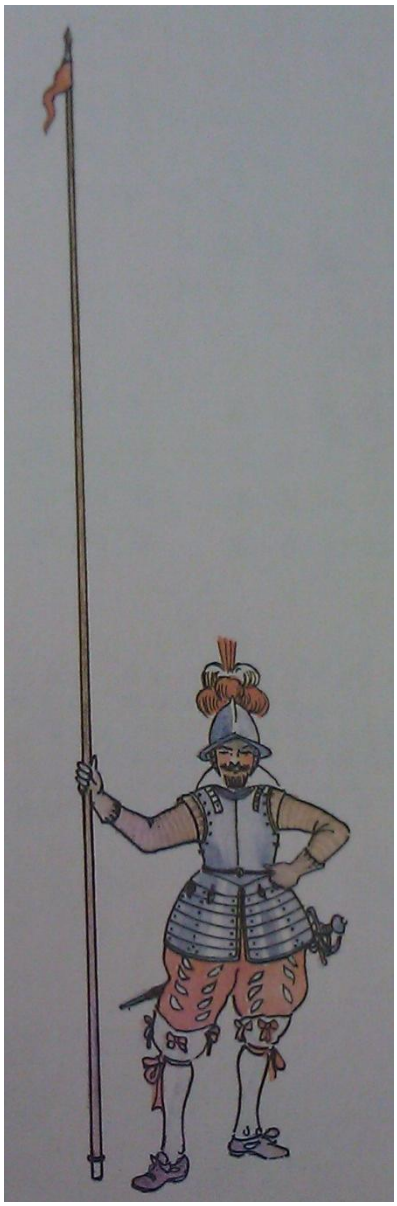
Much thought went into the development of the armor. The thickness of the plate varied throughout the armor, being thickest in the front and on the left side, which was the side that the pikeman would most often have facing the enemy. The layering of the left tasset over the right shows that the armor was designed to defend from the left primarily. The shaping of the plate would cause weapons to glance or bounce off. The edges were rolled into a stop-rib that would prevent weapons glancing off the edge of the armor and into the body in areas like the throat and arms.

The armor was made for the common man. This design is simple and fast to equip, because there were no servants to dress these men there was need to keep the

design simple and intuitive. Fastening one strap about the waist and two hooks on the chest was enough to keep the armor in a battle ready position.

This style of chest plate was gradually phased out as pikemen became obsolete with the advancements of muskets with bayonets. Even at the beginning of the seventeenth century some armies had discarded this form of armor.

The Pike



The design of the armor extends into the weapon as well. The pike as a weapon is somewhat limited. The only effective attack is to thrust and stab with it. The real benefit of the weapon is its range. The pike when used in formation created a shield of points many layers deep.

The pike was almost a purely defensive weapon, when people were dying on the battlefield it was rarely because of the pikeman. The pike was anywhere from 15 to 20 feet in length. Held with the head of the pike at eye level for opposing infantry or planted against the right foot and angled forty five degrees outward for cavalry, an enemy who managed to get past the pikes of the outermost rank would find that every three feet they moved forward was an additional layer of pikes to deal with. The thrust of a pike was a powerful deterrent to anyone thinking of walking into a formation.

The pike was more than just a long stick with a point at the tip. The shaft was typically made of ash wood. The head attached to the end of the shaft with long steel straps, preventing the tip from being easily broken off. The foot of the pike was covered in a protective brass or iron socket that would improve the lifespan of the pike by keeping the wood from splintering.

The Making of Armor

The Armorers

Armor was created by men with a long history of metal working. The armorer was likely a tradesman who belonged to a guild. Before an armorer could have their own shop to make and sell armor they might have to prove their work in the craft for eight years, and register their mark. Depending on the area in which the armorer lived the requirements of guilds or syndicates could be very strict.

The English Armourers' guild, for example, required an apprenticeship of at minimum seven years, with some apprentices working for as many as fourteen years. This period of an armorer's career was marked with low pay, hard labor, and social restrictions that if violated could result in public whippings. The work done by an apprentice was the price of learning the trade. In exchange for the sweat labor they were instructed in the arts of the forge and folding of metal. The years of work would grind and shape the apprentice's most valuable tool, his mind; learning each tool's functions and limitations to turn billets of iron into suits of steel.

The master would have their punch mark registered with the guild. The armor that was produced was marked to identify which

master's shop had made it. To become a master the armorer would have presented a work that met a certain level of quality; their mark would be a commitment to maintaining their good quality. The marks of a master were tied with the guild to which he belonged. The many areas of production had their own guilds and often the guilds were rivals.

The guilds were strongest in the areas with good combinations of raw resources, trade routes, and fast flowing waters. Italy and Germany were major producers of armor for these reasons. Milan and Brescia were the sites of major Italian guilds, as were Cologne and Nuremberg in Germany.

The Resources and Tools Needed to Create Armor

The many varieties of armor that were used in war required an even greater variety of tools to fashion them. The armorers of the seventeenth century did have the advantage of not having to take the raw iron ore through the process of refining it into billets. The billets were often processed into plates by hammer mills, thus reducing the amount of work that the armorer was required to do. The main tasks were to cut and shape the plates and fasten them together with other materials.

Besides the iron and steel that made up the core of the armor, there was also need for leather to support and pad the plates. Leather was often riveted to the inside of armor to keep the wearer protected from the armor itself. Many joints could be made by using rivets or hinges, but the leather was one of the least expensive methods of

providing mobility to armor. Small plates could be riveted onto a leather strap in a way such that the leather was completely covered in the metal while still being able to flex. The use of leather was more forgiving than the tight tolerances required by other methods of articulation.

An armorer would specialize in making certain parts of armor. With the vast selection of types and the myriad of parts that were required for each it would be impossible to be a master of each kind, let alone possess all of the tools required to craft them all.

Mail was physically easier to make than armor that required plate work. The process of Drawing the wire for creating the rings was the most difficult task involved in the making of mail. The rings were flattened at the ends and punched to be riveted into a closed loop. The rings were linked into each other and then rivets were hammered on to seal the link. Mail was incorporated into undergarments to protect the areas that plate armor couldn't protect without restricting movement. It was an inexpensive and time efficient alternative to plate armors

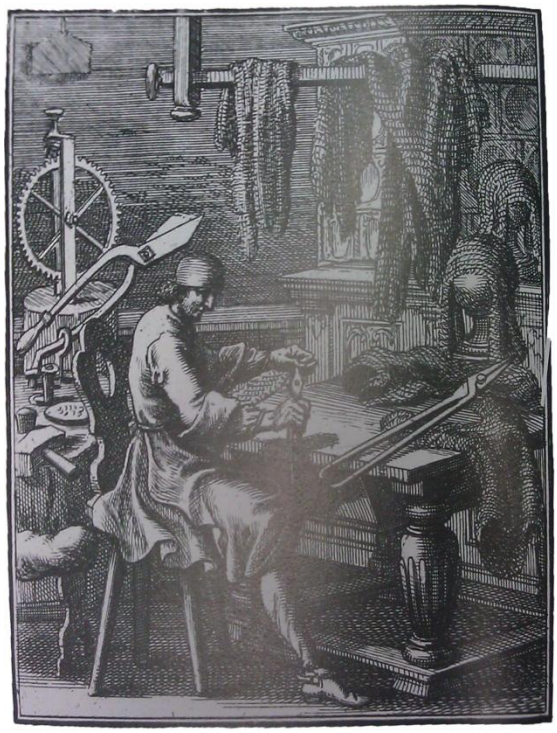


Plate armor required heavier equipment such as the anvil and sledge hammer. The plate would either be formed by the armorer or purchased from an iron producing

center. Then it would be cut into the proper shape for the desired armor. There were smaller shaping anvils that were mounted to the workbench in order to hammer the plate into the correct form. There were also a number of specialized hammers for forming specific curves or punctures for rivets. The plate would have to be heated in the forge on occasion to anneal the metal and to work the edges into a stiffened roll without the metal breaking apart.

Personalization or Mass Production

The purpose for armor was taken into account in its construction. When a nobleman requested a suit of armor for themselves it was fitted to them with exacting precision. The armor that was ordered for an army of several thousand men was made with more of a one size fits most approach. The mass produced models did still have some style and art included in their construction however they were more likely fashioned in minutes.

The common man's armor wasn't something that was used for anything other than battlefield protection. The nobles and officers of the army might have paintings made of them wearing their finest armors, or wear them to ceremonies and parades, but the lower class soldiers wore them in hopes of surviving battles and little else.

Their armor was created to win battles and be a cheap method of doing so. The armor was produced in massive sets that all had the same appearance. The effect of a uniform appearance in battle was to aid in knowing who was on what side. When the enemies all look the same it dehumanizes them and makes killing them easier to accept. The simple inclusion of a colored fabric in the padding trim, a series of rivets in a pattern,

or long colored feathers on the top of the helmet were clear indicators of what side the armor belonged to.

The higher up in society the armor's owner resided the greater the embellishments to the armor became. The social standing of an individual was made into a visual display of their personal surplus. The gold and silver etchings and elaborate engravings were signs of great high standing. The works of art that were worn were painstakingly hand crafted and made to fit perfectly around those with the money to afford their creation. These masterpieces were far less likely to be scratched by the enemies unless their entire army had fallen faster than their owners could make their retreat to safety.

The armors of the high class were made to fit and were more complete armors than the pikeman's. The challenges of making a full suit of armor that wasn't unbearably heavy or cumbersome was a fine art. The layering of plates had to be produced accurately to allow for range of motion. The plates had to have a good metal composition to remain strong against attack while not becoming too heavy. As the advancements in firearms progressed there was little that could be done to make the armors resistant to their effects, shy of reinforcing the torso and head thickness and losing the arm and leg armor to compensate for the added weight.

Era of the Armor's Use

Political Climate

The politics of England in the seventeenth century were somewhat chaotic. The kings of the land had alternating periods of working with and against the English Parliament. The religions of the time were in constant conflict. The kingdoms having deep histories of conflict were still not at ease with being under a common royal head.

The religious variety of the kingdoms was constantly factoring into political activities. The English Parliament had many Puritan influences. The Protestant reformists were angered by the Catholic practices that had been introduced into the English church. The royal system was aided by the appointment of bishops into the church. This put King James at odds with Parliament in the first part of the century. Colonization of Irish and Scottish territories by displacing the locals with Englishmen angered both kingdoms.

King Charles was a political mess. He warred with France and Spain, imposed mandatory loans from his people, and when Parliament didn't help him fund it all over their grievances he attempted to rule without them. When he attempted to make changes in the Scottish church in 1636, the Presbyterians there revolted. His crippled militia was not enough to attempt to stop the revolt and he was forced to restore the Parliament in an attempt to restore his power by paying off the invading Covenant of Presbyterians. In 1641 the Catholics of Ireland had an uprising as well. After not getting his way with the Parliament he attempted to arrest some members who opposed him, they too had had enough and revolted. The eventual defeat of the king's army left Parliament untrusting of their king and many of the social elites unsure of how the traditional social and economic system would be maintained. Using the divisions of interests Charles escaped to Scotland in an attempt to raise another army. The second civil war ended shortly afterward with Charles defeated and beheaded on January 29, 1649.

The Scots appointed Charles II the new king and he fled to France after the Third Civil War in 1651. Parliament refused to dissolve and held power until the leader of the army disbanded them in 1653 for not granting the army the religious liberties they

wanted. The Puritan who was the army's commander, Oliver Cromwell, took the title of "Lord Protector", ruled until he died.

The return of Charles II to the throne was filled with changes in the relationship between king and Parliament. He had Catholic hosts in his time in exile in France and was far more tolerant of religious diversity than the Puritans that were now strongly in control of Parliament. His successor was his brother James II. He was Catholic and replaced key officials with Catholics. The Protestant Church of England only saw him as a real threat after his Catholic wife bore him an heir. The church summoned William of Orange from Holland to bring a military force to oust the Catholic threat. This was the "Glorious Revolution" due to James' fleeing to France without a fight. William ruled with Parliament stronger than ever, he managed to work within the system to get his way; thus closing out the century with only a bit of warring with France to keep Louis XIV in check.

What was the Purpose for the Wars in which this Armor was used?

Many wars were fought for many reasons. Fighting for land, for money, for honor, for revenge, and for resources were all common reasons to go to war. The most likely war that this armor was used in was the English Civil War, a war for representation.

The beginning of the century saw the kingdoms of England, Ireland and Scotland all under the rule of James Stuart in 1603. With his death in 1625 Charles I took the thrones. His method of rule lacked diplomacy and he chose to not summon the English Parliament for eleven years of his rule. When he required new taxes to raise an army to stop a Scottish rebellion he needed the approval of Parliament. The terms that they set

for him to get his taxes were that the Parliament's rights would no longer be ignored. He refused and attempted to arrest the members of the House of Commons who opposed him, thus starting the first English Civil War in 1642.

The House of Commons comprised the representatives of the towns and counties of England. By ignoring the people's request for proper rights of representation in government he turned the masses against him. He was viewed as a tyrannical ruler. The people who made the core of the army of pikemen and musketeers were not going to be on his side.

The belief in a right to representation had brought a revolution to England. In 1648 Charles' army was defeated by the people he once ruled. Still refusing to compromise he was executed for treason. Parliament placed Oliver Cromwell into power, and he refused to share the power with them. When he died in 1658, the Stuart line was restored with Charles II. Charles II set in motion a balance between the king and Parliament. His successor James II was exiled for refusing to respect Parliament. The English Bill of Rights of 1989 was passed establishing rules against rulers interfering with laws.

The Samurai

History of the Samurai

The time of the Samurai can be said to have began many centuries before now. If one were to ask a common day person in what period were the samurai's the answer would probably be the Edo Period. They wouldn't be wrong per se but they wouldn't be acknowledging the many periods that came before that shaped what became the Edo and even beyond that the Meiji Periods. These periods listed are the ones that shall be focused on. The years from 1333 – 1392 are known as the Nanbokucho Period but they shall not be mentioned much.

Heian Period	794-1185 AD
Kamakura Period	1185 – 1333 AD
Muromachi Period	1392 – 1573 AD
Momoyama Period	1573 - 1615
Edo Period	1615 - 1868

Each of these periods was important in that they each played a role in Japan's evolution from a time of arms to a time of peace. In the beginning centuries also known as bronze and iron ages, personal disputes between the common folk or the office. It wasn't until the 8th century when Japan began a transfer of the imperial court from Nara to Heiankyo (modern – day Kyoto) by the Emperor Kammu that things began to change. Derived from the new location of Heiankyo this transfer marked the beginning of the Heian period, a time referred to as the flowering of Japanese culture when the literary and

aristocratic pursuits of the court reigned supreme. (Art of the Samurai: Japanese arms and armor, by Morihiro Ogawa and Kazutoshi Harada)

The Heian period could be seen as the beginning of independence concerning landowners. Owners of *shoen* (private estates) were beginning to gain control over them and began to develop new land of their own. Now the *kokushi* (provincial government) inflicted such heavy taxes that the owners started appealing to the government and making deals to contribute towards taxes with what they gather from their lands. Eventually shoen owners began freeing themselves from the kokushi with their own hands. The owners in order to protect themselves from *kendenshi* (the officials who inspected land and levied taxes on behalf of the kokushi) hired warrior-retainers. These ienoko or roto were the first of what people today would call samurai. Together, leaders and the retainers they hired formed military bands (bushidan) that maintained order. (Art of the Samurai: Japanese arms and armor, by Morihiro Ogawa and Kazutoshi Harada)

It wasn't too bad at first. More and more of the kokushi would have created more freedom if the leaders of the conquering *bushi* (men of arms) didn't get power hungry and begin to claim the title of *Shinno* ("The New Emperor") for themselves. So began a deadly chain of different bushidan taking each other out. Ironically some of the bushidan were taken down by leaderless bushi who wanted to be acknowledged by the imperial court they were originally hired to fight. It wasn't long before even the imperial court recognized the power of the bushi and started hiring individual samurai to protect them. (Art of the Samurai: Japanese arms and armor, by Morihiro Ogawa and Kazutoshi Harada)

Eventually there were set people who claimed the high titles. Yet men couldn't help but fight for power. As soon as those with power died or retired, battles ensued between those who wished for the available power. In 1159, the Heiji Disturbance broke out. It was a clear that it was just a chain of defeat. Every time someone took down another soon took him down. In the end the balance of power fell towards Taira no Kiyomori. Taira's reign was not immortal however, and his defeat to Minamoto no Yoritomo was the sign of the end of the Heian Period, and the beginning of the Kamakura Period.

The Kamakura period can be seen as the beginning of Japan's military prowess. Compared to the Heian period where fighting for freedom was a new idea, the Kamakura period really had many strides in their military. As if to initiate the Kamakura Period, Minamoto no Yoritomo was appointed as the first Shogun by the emperor. The Shogun is a very high position, as they are the generals of the Emperor's armies. Anyone familiar with warfare could vouch just how important good leadership is in battle, so one can only imagine just how revered the Shogun was in a time of battle. So with such a position, Minamoto in 1192 set up Japan's first *bakufu* (military government) at Kamakura. This was an important step forward from the previous system where it was centered on the emperor, nobility, and the personal retainers hired to serve them. Granted this new system was not a complete replacement. Minamoto still had to answer to the emperor on the important decisions. But no matter how much he had to answer to the emperor, Minamoto still had complete control of the military force. He even appointed some retainers to keep his power alive. Even after Minamoto's death, the newly appointed retainers were able to eliminate his enemies and consolidate the power of the Kamakura

shogunate. In 1232, Minamoto's son, Hojo Yasutoki, introduced the first code of samurai law, the *Joei-shikimoku,* and it heralded the golden age of the Kamakura bakufu. (Art of the Samurai: Japanese arms and armor, by Morihiro Ogawa and Kazutoshi Harada)

Later in the 13th century, the Mongols swept into China and soon took over; declaring themselves as the Yuan Dynasty. Constantly the Mongols sent envoys to Japan demanding tribute, but since Japan refused every time, the Mongols sent their forces in to take their tributes through force. There were two attempts the first consisting of 30,000 men and the second consisting of 140,000. The first attack, the Mongols teamed up with the Koreans and fought their way to Kyushu. The Mongols did arguably have an advantage in that unlike the Samurai, they did not worry about honor in battle and did whatever they had to in order to achieve victory. Sadly luck was on the Mongol's side as a typhoon took out many of their forces and made them retreat. The second time the Mongol's attacked, the Japanese were prepared and had constructed walls and fortresses on their shores. Though the Mongols did bring a much larger force this time around, one again a typhoon came once again and the Mongols were forced to retreat a second time. (Art of the Samurai: Japanese arms and armor, by Morihiro Ogawa and Kazutoshi Harada)These great defends were later known as the "Expulsion of the Yuan". Yet even if Japan was great at defending from outside forces, it wasn't so successful when it came to internal wars. The current system of power slowly broke down, and then it disintegrated into several groups of local lords and their retainers. These few decades of battles, known as the Nanbokucho Period, was the slow breakdown of the Kamakura period and the beginning of the Muromachi Period. (Art of the Samurai: Japanese arms and armor, by Morihiro Ogawa and Kazutoshi Harada)

Muromachi Period began have a series of grueling battles ended the Kamakura period, but the battles did not end there. In fact one could say that the new period brought an evolution as contact between the warrior class and the nobility increased to the point where the two societies gradually merged. These wars escalated over time. Toward the end of the 1460's, the Ashikaga shogun Yoshimasa and his family became embroiled in a power struggle over succession between the two daimyo of the Hosokawa and Yamana families. At the end of this conflict, known as the Onin War, Japan was plunged into disorder for the next century. This period of turmoil was deemed the name the Age of Wars. This is an interesting comparison compared to the previous periods. In the past the samurai were only seen as tools of good. They brought freedom to those who didn't have it. But now, ironically the samurai are used to take away all the freedom they brought and then some. The Age of Wars is a good example of how having great military might isn't always that great at all. (Art of the Samurai: Japanese arms and armor, by Morihiro Ogawa and Kazutoshi Harada)

Three men later brought the Age of Wars to an end and began the Momoyama Period: Odo Nobunaga, Toyotomi Hideyoshi, and Tokugawa Ieyasu. Nobunaga worked to consolidate his suzerainty over Koto and went around reducing the military power of Buddhist temples. After his forced suicide, Hideyoshi took the reins and by 1590 had effectively brought all of Japan under his control. He did support the emperors but in the end Hideyoshi was still the true ruler of the country. He then gave most of the Kanto area to Ieyasu. Hideyoshi through his power effectively took down internal wars by confiscating swords from all except special members of the upper class. When Hideyoshi died, he left everything to his son, Hideyori. But Ieyasu, fueled by ambitions for his

family's future, took down Hideyori and effectively ended the Momoyama Period. (Art of the Samurai: Japanese arms and armor, by Morihiro Ogawa and Kazutoshi Harada)

The new period became popularly known as the Edo period, named after the small fishing village (eventually becoming Tokyo) where Ieyasu build a castle before he became shogun in 1603. This was a period of economy as it soon expanded very rapidly until the early 1700's, and an affluent middle class emerged. The economy was branching out so far and fast, that Japan influenced by the Western powers, the bakufu shut Japan's doors to the outside world, permitting few exchanges. This greatly affected the state of Japan in that the Japanese merchant class prospered but those tied to agricultural production like the daimyo's suffered. Regardless by the end of all the country lost a lot of confidence in the samurai.

The Samurai

The samurai, the tools of battle, were being lost in the new times of economy. What use were the samurai if there were no longer any battles being fought? Even the way of the sword was reduced to a mere sport (kendo). But though the samurai had lost a lot of its loyalty, the important thing to note is with the new Edo Period, Japan was no longer fueled by battles and internal strife. It was a land of economics. Even if Japan was isolated from a lot of the outer countries the fact that conflicts were no longer solved with swords can be considered a win. One could say that it's thanks to Hideyoshi for taking away everyone's swords but all that needs to be acknowledged is that Japan is finally moving, if ever so slowly, to a time of greater peace.

The term "Samurai" is pretty well known throughout the world. "Samurai" is the word for a Japanese warrior, more specifically a warrior who followed the code of

"Bushido". What many people don't know; however, is that samurai are not just Japanese men who swing around a sword in the time of battle. In its purest form, the term "samurai" describes a type of intellectual warrior, who can be closely related the European Knights Templar. A main difference from samurai and the common soldier is that the samurai were an entire class in society. They were a great influence towards Japan's intellectual development, making great achievements in the fields of literature, the arts and music. To compare the samurai to a knight one could say that while both protected their land, the samurai alone evolved it as well. (Samurai Warriors by David Miller)

One of the most important and unique things about the Samurai is that they have a warrior's code of honor also known as Bushido. If there was one thing to summarize the Samurai it would be their code. Here is a summary of Bushido by an anonymous philosopher from about 1300. There are a few interpretations but overall it has become known as "The Creed of the Samurai"

"I have no parents; I make the Heavens and the Earth my parents.

I have no home; I make the *Tan T'ien* my home.

I have no divine power; I make honesty my Divine Power.

I have no means; I make Docility my means.

I have no magic power; I make personality my Magic Power.

I have neither life nor death; I make *A Um* my Life and Death.

I have no body; I make Stoicism my Body.

I have no eyes; I make the Flash of Lighting my eyes.

I have no ears; I make Sensibility my Ears.

I have no limbs; I make Promptitude my Limbs.

I have no Laws; I make Self-Protection my Laws.

I have no strategy; I make the Right to Kill and the Right to Restore Life my Strategy.

I have no designs; I make Seizing the Opportunity by the Forelock my Designs.

I have no miracles; I make Righteous Laws my Miracle.

I have no principles; I make Adaptability to all circumstances my Principle.

I have no tactics; I make Emptiness and Fullness my Tactics.

I have no talent; I make Ready With my Talent.

I have no friends; I make my Mind my Friend.

I have no enemy; I make Incautiousness my Enemy.

I have no armour; I make Benevolence my Armour.

I have no castle; I make Immovable Mind my Castle.

I have no sword; I make my Mind my Sword."

After reading this passage, one might realize that there is a sense of spirituality woven in with these words. In actuality *Bujutsu* "The martial art of the Samurai" has a close relationship with a particular sect of Buddhism known in Japan as *Zen*. General claims suggest that Zen was the foundation of martial arts in feudal Japan. Zen supposedly provided Bujutsu with the justification to practice the martial arts. Samurai actually would join Zen temples in order to meditate and prepare before they set out for battle. These meditation halls were called *dojos* (the name of a place devoted to religious exercise). The dojos back then weren't that different than the dojos today that practice more practiced martial arts like judo, karate, aikido, and kendo. (Secrets of the Samurai by Oscar Ratti and Adele Westbrook)

Spirituality aside, the creed can still seems pretty poetic, but it gives a good idea on how Bushido works. Samurai do not follow the normal paths of humans. They are not tied down by earthly desires, nor do they fear death. To the Samurai, all that matters is their honor and following the way of the sword. Honor is everything to the samurai. If for whatever reason a Samurai is unable to live up to any of the high ideals beset upon him, he has at that point forfeited his honor and must commit seppuku (ritual suicide). (Samurai Warriors by David Miller)

Seppuku is one of the most misunderstood aspects of the Samurai. It is generally known as what a Samurai does after losing a battle, since the shame of losing was too

much to bear. While this was a true occurrence, it is important to note that to the Samurai, seppuku is something done to withhold honor, not just because of shame. There are those who commit seppuku in order to prevent themselves from being captured. Some committed seppuku in order to follow their lord in death. Samurai, in order to protest against the bad actions of a superior, have committed seppuku in a hopeful attempt to gain the superior's attention and change their ways. A normal man might find such actions silly as it's natural to fear death, but one must remember that the Samurai are beyond that.

The *Hagakure* (a practical and spiritual guide to the ways of the Samurai) itself quite clearly states that that the code of the Samurai, Bushido, was indeed a code of death. Basically a samurai must always be prepared for a sudden and violent end to his noble life. If one was brought up to be a samurai when he came of age, he would always be treated to very harsh conditions, not allowing a single complaint, as a form of training. But not for training for battle or anything in that regard. The harshest of trainings were always so that there would be no hesitation at all when it came to committing seppuku. To the samurai, committing seppuku was the ultimate symbol of controlling one's destiny. This and having unflinching courage in the face of death were some of the greatest privileges that the Samurai had. (Secrets of the Samurai by Oscar Ratti and Adele Westbrook)

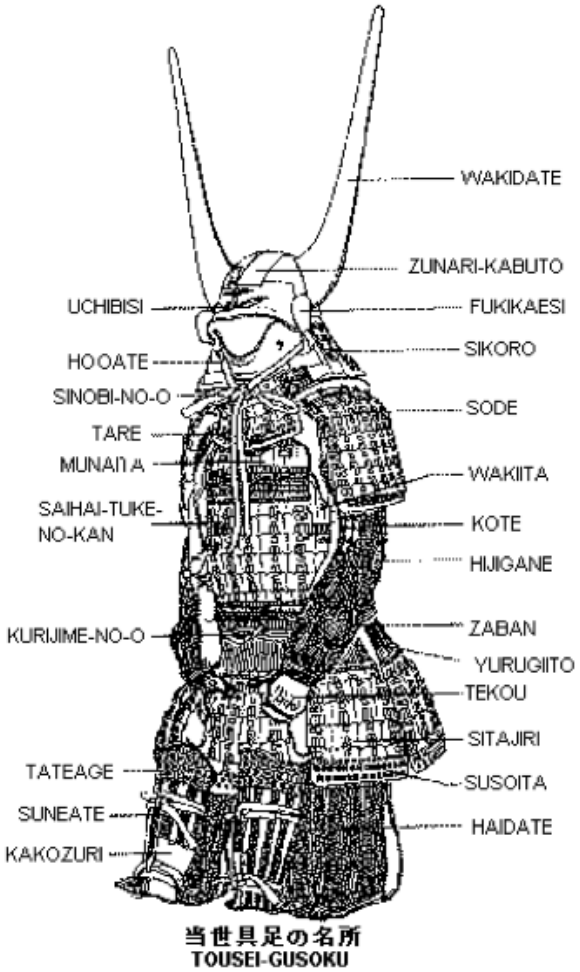
The most important element to the way of the Samurai was loyalty. Thus logic dictates that the Samurai must have someone to swear their loyalty to, and that a Samurai without someone to be loyal to doesn't exist. This is not true. There were a couple of reasons why a samurai would not have someone to swear loyalty to. Their lord might

have died or lost his title. Sometimes the samurai might have survived a slaughtering or a lord could dismiss the Samurai from his services. A Samurai without a lord is not referred to as a Samurai anymore, but a Ronin. Ronin spend most of their time trying to find new masters, but not all of them are so lucky. Most of those who are unable to find new lords band together as mercenaries for hire but there are those who would betray their old customs and become rogues or robbers. (Samurai Warriors by David Miller)

Ironically one of Japan's greatest tales involving loyalty is about a group of Ronin. It's entitled the "Forty-seven Ronin", based on real events that occurred at the start of the 18th century. It started off with a daimyo (lord), Asano, who had bad relations with a chief of protocol, Kira. In one of their meetings for reasons unknown, Asano drew his sword and attacked Kira. Besides the fact that Asano had attacked Kira, he had drawn his sword in the *shogun's* palace. So after some delegations, Asano was ordered to commit seppuku. This itself went down pretty well but then came the issue of what to do with Asano's title and land. Normal customs would dictate that the title and land be dismissed, but there was also the option of passing everything onto Asano's younger brother. The final decision was to follow normal customs and just dismiss the Asano's title and land completely. This meant to all of the Samurai who were following to Asano were forced to become Ronin. 47 of these retainers swore revenge and devised a long-term plan. Many decades later these "Forty-seven Ronin" snuck into the capital, broke into Kira's house, took his head, and brought it back to their dead master's grave as a sign of loyalty before they quietly surrendered and in the end committed seppuku. (Samurai Warriors by David Miller)

The Samurai's Armor

Japanese samurai armor is quite unique when compared to European armor in that unlike European armor, which is made of a few strong pieces of metal, samurai armor is made up of hundreds of little plates. This style of armor is known as lamellar armor. An important feature in this type of armor is that it was flexible. Metal armor is usually only movable at the joints but the lamellar style of Samurai armor allows it to have a better fit for quick and abrupt movements.



But Japan's armor is scaled so not only can it move as much as the user desires, but it can withstand a good amount of force. As one can see in the picture on the right of a samurai's armor from the Higgins Armory Museum, there are many features that set it quite far apart from the more recognized European armor.

The *kabuto* “helmet” is the most eye-catching piece of the armor. Not just in this piece but also in most if not all samurai armor, a lot more detail than one would deem necessary is put into this armor. One not familiar with the Japanese might be wondering why there is so much detail in a mask and decorations of all sorts on different helmets. This is because *kabutos* serve as both protection and a status symbol. After the actual helmet is made, crests are attached to the helmet, acting not only as decoration, but a symbol of who the wearer was. The mask was an intimidation tactic of sorts, as it mean that the samurai inside the armor was no longer human, but a demon. (Samurai: The Code of the Warrior by Thomas Louis)

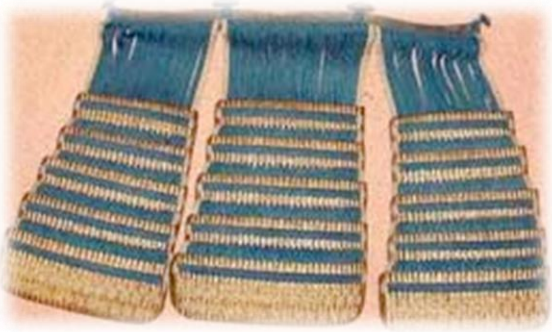
In the past the *kabuto* was only made of a few plates, but as the centuries passed more and more plates would be used to the point where as many as 120 plates would be used to make one *kabuto*. Sometimes there would be a hole in the *kabuto’s* crown called a *tehen*. This is for the samurai to feed his pigtail through if his hair was long enough. The *shikoro* “neck guard” was riveted to the *kabuto* and was comprised of three to seven rows of metal plates. Leather and many smaller plates reinforced these plates. The last row called the *hishinui-no-ita,* was often lined with leather to stop it from hitting the *sode* “shoulder plates.” (Samurai: The Code of the Warrior by Thomas Louis)

Sode are large and rectangular, made up of up to seven rows of lamellae and a curved iron plate. Cords were fastened to rings inside the upper edge, which were used to attach the plates to the rest of the armor. In the early ages of the samurai, when they still used bows as a primary weapon, the placement of protection of the shoulders and arms differed. If a bow were being used usually their dominant arm would have merely a sleeve with a rounded plate on the back of the hand. The *sode* would only be worn on the non-dominant shoulder. This was because even though *sode* give protection, they also restricted the movement that is necessary to make accurate shots with a bow. It was also not as necessary to protect the dominant shoulder, as it would normally be turned away from any attackers as the arrow was readied. This lack of defense would be fixed in later periods when the samurai begin to disregard the bow as a weapon. (Samurai: The Code of the Warrior by Thomas Louis)

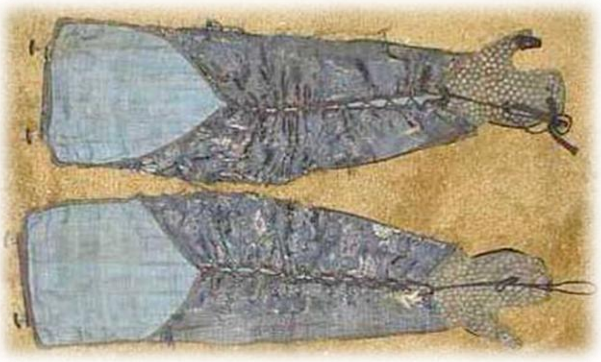
While foot soldiers wore the original Japanese armor of the *keiko* style, sometime in the middle/late Heian Period mounted samurai began to use what would become the classic samurai armor called the *o-yoroi* "great armor" for the mounted warrior.

The picture to the left is the original samurai armor, the *keiko* style. The blue samurai armor shown earlier is an example of *o-yoroi* style armor. It is quite easy to note some obvious differences in style. (Samurai: The Code of the Warrior by Thomas Louis)

The body of *o-yoroi* armor, the *do,* consisted of four lamellar boards laced together with silk and leather cords. Since there were many scales covering the *do,* there was a chance for a bow to be snagged so it was covered with a leather panel. This leather panel had dual purposes as it was often decorated with designs, some honoring the Shinto and Buddhist gods. Unlike some sets of *keiko* which sometimes lacked a *sode* because of the bow, *o-yoroi* had both *sode.* They were attached to the *do* with *watagami* "shoulder straps" and tied together at the back with an *agemaki* "decorative tassel". As time passed and samurai began to move past fighting on mounts and back on the ground, changes were noted in the weight of the armor and the length of some pieces. The colors of the cords used to tie the pieces together were also being used to represent the samurai's individual samurai clan, though a white lacing was the color of mourning and it meant the samurai didn't expect to survive the next battle. (Oriental Armour by Russell Robinson)



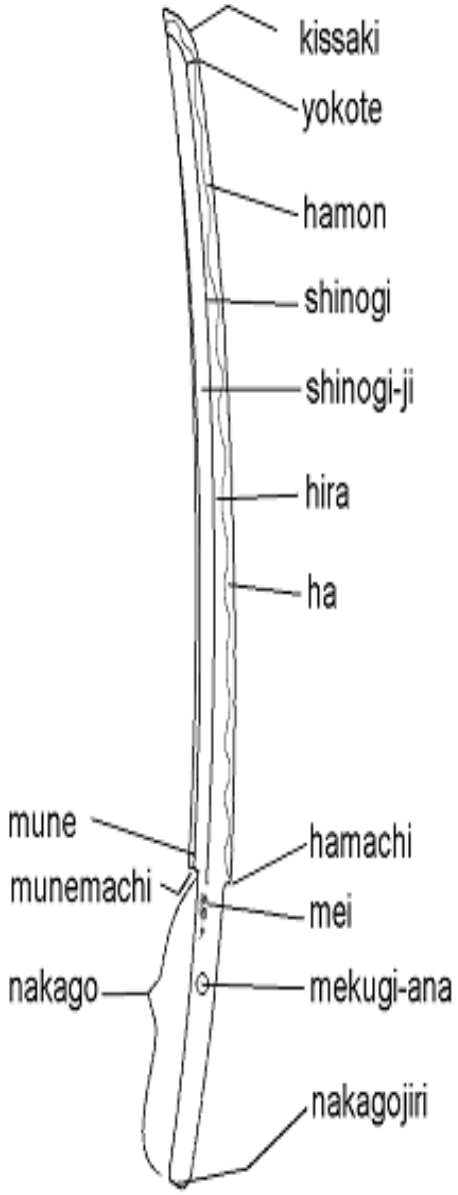
Also technically considered part of the *do* was the protective skirt called the *kusazuri.* As in the picture to the right, the kusazuri was typically made of 3 plates, fashioned in a lamellar style. The front plate would be attached along with the chest part of the *do,* followed by the side plates, which are tied with leather strips. The entire skirt section as a whole was called the *waidate*. (Oriental Armour by Russell Robinson)



The *kote* "sleeves" were primarily made of fabric as seen in the blue armor shown earlier. There were times starting around the 14th century when the mail was used on the arms, but even then it was always mounted on fabric. (Oriental Armour by Russell Robinson)

The Samurai's Weapons

The Japanese sword has been called the soul of the samurai. This can be derived from the idea that any true swordsman becomes one with his/her sword, and the samurai take that to heart. Yet one must never forget that no matter how poetically it is described, the Japanese sword is a terrible and efficient weapon combining a beauty of form with an elegance of function. The beauty of Japanese swords is undeniable, and there are many samurai who had swords that were forged specifically for them, however the true craft is in its sharpness and potential use as a weapon. The samurai used the Japanese sword, and the samurai are in the end warriors who believe that losing means death. When a samurai loses a battle, should he survive till the end of it he is so ashamed that he takes his own life. But as the type of warfare practiced by Japan changed over the centuries, the form of the Japanese sword changed as well. Every period in Japan's history was unique, and the same could be said for the sword. Just like the samurai, Japanese swords are always evolving with the hope that perfection is one day reached.



The Japanese sword is a different type when compared to European swords. The blade is made of two forms of steel: A harder outer jacket, to have that hard and sharp cutting edge, and a softer inner core to absorb shocks and prevent damage to the blade in combat. The *hadagane* (the outer skin of the blade) is produced through heating a block of steel, cooling it, and checking for impurities. When quality steel is at hand it's folded upon itself many times. The *shingane* "the inner core" is made in a similar way to that of the *hadagane* but it's folded less. The *hadagane* is then reheated and shaped so that the *shingane* can be inserted into it, resulting in a long steel bar. At the tip a triangular section is cut off to create the *kissaki "tip"*. The rectangular blank of the blade at his point is called the *sunobe*, which is heated, and section-by-section hammered to create the recognizable individual parts of the blade. There is the *mune*, "thick back edge" *ha*, "thinner cutting edge" and other tiny characteristics all of which are separate from the *nakago "*tang". After all this, the *sunobe* is finished through a filing and scraping process to make sure everything is desirable. The

blade is then rinsed and left to dry, and after the finishing touches are applied to the cutting edge to make sure it's hard and sharp. Source: (The Japanese Sword : The Soul of the Samurai by Gregory Irvine)

The early Heian-period's Japanese sword was very similar to the Japanese sword as it is known today, with its deep, graceful curve. This design could be seen as a sign of the change in Japan's warfare. The main features of the swords of the Heian period are the distinctive curve of the blade, predominantly near the hilt, in what is termed *koshi-zori* "waist curve", with the upper part of the blade being almost straight. While most of the sword length is long, slender, and elegant, the width of the sword suddenly increases. The *kissaki* "tip" of the sword is quite small and is made with a straight edge. This is ideal for the thrust towards a gap in the opponent's armor. Though if wielded by a truly skilled swordsman, the sword's curved design could allow the swordsman to cut down straight through his target's armor and into flesh. Source: (The Japanese Sword : The Soul of the Samurai by Gregory Irvine)

The Kamakura period has often been referred to as the Golden Age of the Japanese Sword. A big contributor to this was the fact that since at this time Kamakura was a major military centre, a great amount of sword smiths came from all over Japan, bringing with them a multitude of different techniques and traditions. In 1221 the cloistered Emperor Go-Toba had attempted to overthrow the Hojo Bakufu, but was defeated and exiled to the island of Oki. In his exile, Go-Toba called upon the services of many eminent sword smiths and sword polishers. These craftsmen were given the title *Goban Kaji* "smiths in the attendance to the emperor" and together made a series of swords that gave the Japanese sword even more status as an art object rather than a

killing instrument. As time passed the blades of the Kamakura period began to diverge from the blades of the Heian period, as the demand for good functional blades was growing stronger than before. Source: (The Japanese Sword : The Soul of the Samurai by Gregory Irvine)

The already curved blade gained an even deeper curve and a more consistent breadth. The blade acquired an increase in thickness and a more convex cross-section, enabling it to cut through armor more efficiently. This greater need to cut through armor was a reflection of the change in the patterns of warfare. Long range weapons like the bow and arrow were starting to be forgotten as hand-to-hand combat was becoming more favored. The amount of active sword smiths was increasing dramatically; one of these sword smiths being the legendary Masamune, believed to work during the late years of the Kamakura period: 1288–1328. Masamune blades were as strong as they were beautiful. Masamune had improved the forging techniques of the time and used a complicated combination of steels in order to create the best swords possible. Source: (The Japanese Sword : The Soul of the Samurai by Gregory Irvine)

One of the most key and valued points to the Masamune blades was the wider tempered edge. When swords are damaged and/or worn out, the blade must be ground down into to make the blade sharp and usable again. The width of the tempered edge is how much the blade could be ground down, so Masamune blades effectively increased the lives of blades by a good margin. This was very important since the constant attacks by Mongols brought a greater and greater need for hand-to-hand combat. With Masamune at its peak, the Kamakura period had been the time of some of the best swords

in Japanese history. Source: (The Japanese Sword : The Soul of the Samurai by Gregory Irvine)

As time moved on in to the Muromachi Periods, the importance of cutting power for ground soldiers increased, and with it the structure of the sword evolved as well. The sword became much longer and heavier right down to the tip. Unlike most Japanese swords, which are carried at the waist, these were treated more like broadswords and carried over the soldiers back. Blades were just in so high demand that the design was just ever changing.

There was a problem with the high demand of blades, being that no amount of swords was enough. The sword smiths were forced to constantly forge one sword after another. There were so many new swords being made that eventually it even became a problem to identify who made which blades because they were all so rushed.

By this point there was an almost complete change in the style of warfare during the Muromachi period from battles involving cavalry and individual combat to those involving infantry. The already long blade was reworked for the different samurai into two main types of swords. Source: (The Japanese Sword : The Soul of the Samurai by Gregory Irvine)

The first type is what most people know as the Japanese sword, the Katana. One of the finer points of this blade actually lied within the scabbard. The scabbard was

curved in such a way that when the sword was drawn the scabbard didn't move with it.

This way the action of drawing the sword was an actual striking blow as well. Also unlike the previous longer blades, the lightness allowed this blade to be handled with one hand fairly easily. This was a very important trait distinctive to the importance of close combat that originated during this period.

The second type is a less known blade known as the wakizashi. It is a much shorter blade and is usually carried as a companion blade for extremely close combat. The short blade was extremely convenient size so even though samurai would put down their katanas for certain tasks they would always carry the wakizashi on them at all times. These two blades were also the first of the

Japanese swords to have a *tsuba* "hand guard". Come the Edo period, Japan received new to help with the production of steel and the importation of iron. Another influence could be seen the Japanese swords as they lost most of their curvature to the point that they might as well have been straight swords. These new blades were called *Kambun Shinto.* There are many theories as to what brought about this change, one of the most popular being the establishment of dojos and the sport of *kendo* "the way of the sword". Kendo was a development of the establishment of peace in Japan after years of battle, much of which was taught by Ronin who wanted to preserve their martial traditions.

Conclusion

These four armors each carry several centuries' worth of history, culture, and tradition from the battlefield lineage of Knights to Pikemen, to the culturally significant Joust, finishing across the world with the Japanese traditions of the Samurai. Through these significant sets of armors, we can learn not only about the armors themselves, but about the time, place, and situation in which they existed as well. Although many people claim they know what a Knight's battlefield plate armor is or what a samurai armor is because they have seen them in comic books, cartoons, or video games, unless they know the history and understand the events surrounding the armor, all they have is a misconstrued illusion backed only by what they see through the media.

Each were, at one point, very crucial representations of their backgrounds, and their backgrounds played an equally important role in the armors' features. Every event and situation that happened in the armors' respective countries carved a path that led to these armors being built for their own specific purpose. It is not a coincidence that although the knight's armor came before the pikeman's armor or this particular jousting armor, the jousting armor was heavier while the pikeman's armor was much lighter. They were each made for a specific purpose and with specific features that were dictated by the circumstances of their respective backgrounds. Vice-versa, these armors helped carve the future of their countries through the roles they have played in fulfilling their purposes. Furthermore, they have cleared the path for new military, recreational, and ceremonial centerpieces. Although the world may fight with missiles and bombs, play recreational sports like basketball and soccer, and hold ceremonies in a very different way today, it is important to remember an age when technology wasn't at the focal point of these events. It is important to remember the age of the armor.

The first stage of the project was the pre-qualifying project. In this stage, our team was formed and we completed all preliminary work in preparation for the main terms of the project. The main deliverable of this term was the IQP Project Proposal. This proposal introduced the project and the armors, as well as identifying the main topics about each armor that would be studied, and the subtopics that would go under each main topic. For each armor, we identified four topics, and for each topic, we identified several subtopics. The proposal also identified the main target components of the final project, listed valuable assets that may be of use, and set a pre-determined timeline for the course of the project which set deadlines for each task that needed to be accomplished. In this part of the project, we were also given the task to edit the previous year's video as it had yet to meet a professional standard. The final task of this portion of the project was to create a bibliography of at least twenty sources for each topic. This allowed us to have at our disposal a large selection of literature to research. There was one main trial that we faced during this phase of the project which was the loss of one of our members at the end of the term and the gain of a new member. This trial forced us to rethink our team dynamics to suit the new team environment.

The second phase of the project was the first main term. The main deliverables of this term were the individual research documents of each member for each armor and the continuation of the post-editing for the previous year's video. In this phase of the project, we utilized the bibliographies previously created and ordered the books that would be used for research purposes. Every week each member wrote a new section of the individual documents, and previously written sections were iterated and the necessary corrections made. A final and complete version of the sources used in our research can be found in Appendix A.

In the next term of the project, we began making progress on the final deliverable of our project: the video. This term was dedicated to finishing the post-production of the previous video, starting a catalog of all videos in the Higgins Armory Museum database, and writing the script of the video. Unfortunately, due to time constraints of the video's length, we chose to leave the section of the pikemen out of the final video. The script also included finding potential pictures to go with each section of the script as the visual component of the video. We accomplished this by finding multiple pictures that could go in each section and selecting the one we felt was the most visually attractive and demonstrated the meaning of the words best. After completing the post production, the previous year's video was put on display for its premier showing at the Higgins Armor Museum, an event to which we were guests. This term also served as the term in which we gathered all of our visual components. In order to add to the videos in the database, we attended a pikeman Re-enactment in Plymouth, MA and gathered video footage. We also went to the Higgins Armory Museum and took the respective armors off their displays in order to take videos and images of the sections we required for the video.

The final term of the project was spent finalizing all of the deliverables of the project. In this term, we finalized the script and selected the images that would be used in the video. We also chose music that could potentially be the audio for the video, narrowing our choices down until we decided on the best background music for the tone of our video. As well as completing the final report during this phase of the project, the final deliverable, the video, was also completed with the intention of being put on display at the Higgins Armory Museum.

The main processes of this project: post-production, researching the subjects, writing the script and creating the video were all extensive processes. The post-production was a time of learning as the team attended a workshop for adobe premiere. It posed a challenge as the

materials we were given to work with by the previous team were poorly set up, making post-production difficult. The script we were given to work with was disorganized, and not in its final form. Sources for images and other files were missing, and video was taken with modern day items such as cars in the background. But, due to awkward zooming, cropping of those modern day objects was a challenge. The files we were given to work with for editing had been compiled into one video, making breaking it apart to edit specific images, sound and transitions very difficult. We were also not given all of the required files until late into the year, postponing completion of the post-production. On top of it all, their project was poorly organized and titles for sections and folders were not obvious, making finding the parts we needed to edit difficult. To overcome these issues, we had to be creative in our approach to finding a solution, often resorting to indirect methods. For example, to fix the script, we listened to the entire video's narration, copying the script by hand word for word before we could make any necessary edits. In order to prevent future difficulties, we have included in our report a protocol to follow during the duration of the IQP project (see Appendix D).

Researching the subjects was time consuming as resources were not readily available to us and the books we required to write the sections often took a very long time to arrive. The writing of the script required extensive iteration, sometimes reverting to how sections were originally written after several iterations. Finally, the video was the most extensive process of them all as it required taking everything that we had gathered and putting it together. This required hours upon hours of work as editing to perfect the video to our high standard was essential in our opinions.

Overall, we are very pleased with our work on this project. We made a project proposal during last year's PQP session and have tried hard all year to stick to our schedule. One

accomplishment that we are especially proud of is our job in editing last year's video. This task took longer than we initially estimated, and there were times when we felt frustrated but eventually we were able to put out a quality video that we could be proud to show in the Higgins Armory Museum. While we were working on this video, we were also getting resources for our own project video, writing and editing our subtopic essays each week, and updating our project proposal to accommodate any changes made. Most of the work done during this initial writing stage was very independent and didn't require teamwork, and so our works varied based on each individual's strengths and weaknesses.

This realization of our strengths and weaknesses proved to be invaluable in the next stage however, as we were tasked to search for usable images and write the script. We were able to divide the work based to each member's strengths as we felt this was the most efficient way for our group to function. We feel this distribution of work was vital to the team's success. One problem we had during this stage was the work ratios split among our members. Based on our method of playing to each individual's strengths, there were occasions when certain members did not have much to contribute and others had to carry the burden. However, we worked through this by being patient and understanding of each other. We also met with a group counselor to help us with our team dynamics. This proved very helpful to the group and we were able to come out of this obstacle stronger as a group than before. Another obstacle we had this stage was ensuring each picture used in our script wasn't copyrighted and was of good enough quality to be displayed in a large screen or projector. This obstacle was overcome with hours of hard work and searching the Internet using multiple methods.

Our main goal may have been to make a video, but the goal of this project was to teach us and give us experience with team projects. We have all worked hard and contributed long hours

in order to meet our goal, and in the process learned not only about the subject matter but about ourselves. We learned about our strengths, our weaknesses, how we can each contribute in a group, and what it means to work in a group towards a goal. In this regard, this project has been a complete success.

Appendices

Appendix A: Works Cited

Sources – Late Medieval Composite Field Battle Armor (2607)

*Primary Source Document on MyWPI to be used as well

Week-by-Week:

Week One:

History of Late Medieval Europe

Subtopics: Technology, Exploration, Statebuilding, Renaissance Italy, Art, Printing

Sources Used:

Chambers, W, & Chambers, R. (1858). *Medieval History*. London, England

Cohen, E. S, & Cohen, T. V. (2001). *Daily Life in Renaissance Italy*. Westport, CT: Greenwood Publishing Group, Inc.

Crompton, S. W. (2004). *The Printing Press*. USA: Chelsea House Publishers.

Dahmus, J. (1968). *A History of the Middle Ages*. USA

Frazee, C. A. (1997). *World History: Ancient and Medieval Times to A.D. 1500*. Hauppauge, NY: Barron's Educational Series, Inc.

Total: 5

Week Two:

Knighthood

Subtopics: Customs of a Knight, How to become a Knight, Other types of people on the battlefield, Late Medieval Warfare, Infantry and Firearms/Cannons, Archers and Bows, Castles

Sources Used:

Bradbury, J. (1985). *The Medieval Archer*. New York, NY: St. Martin's Press.

Brooks, R. (2000). *Atlas of World Military History*. London, England: Harper Collins.

Corrick, J. A. (2000). *Life of a Medieval Knight*. Lucent Books.

DeVries, K. (1992). *Medieval Military Technology*. New York, NY: Broadview Press.

Keen, M. (1984). *Chivalry*. New Haven, CT: Yale University Press.

Rogers, C. J. (2007). *Soldiers Lives Through History: The Middle Ages*. Westport, CT: Greenwood Publishing Group, Inc.

Total: 6

Week Three:

Armor

Subtopics: Styles, Metallurgy, Creators, Cost, Weight, Protection, Uses, Disadvantages

Sources Used:

Bull, S. (1991). *An Historical Guide to Arms and Armor*. New York, NY: Facts on File.

Edge, D, & Paddock, J. M. (1988). *Arms & Armor of the Medieval Knight : an Illustrated History of Weaponry in the Middle Ages*. New York, NY: Crescent Books.

Ffoulkes, C. (1912). *The Armourer and his Craft*. London, England: Methuen.

Norman, V. (1964). *Arms and Armor*. New York, NY: G. P. Putnam's Sons.

Williams, A. (2003). *The Knight and Blast Furnace: a History of the Metallurgy of Armour in the Middle Ages & the Early Modern Period*. Leiden: Brill.

Total: 5

Week Four:

Weapons

Subtopics: Different types, Reasons for their Uses, Techniques of Use

Sources Used:

Bull, S. (1991). *An Historical Guide to Arms and Armor*. New York, NY: Facts on File.

Edge, D, & Paddock, J. M. (1988). *Arms & Armor of the Medieval Knight : an Illustrated History of Weaponry in the Middle Ages*. New York, NY: Crescent Books.

Norman, V. (1964). *Arms and Armor*. New York, NY: G. P. Putnam's Sons.

Oakeshott, E. (1980). *The Sword in the Age of Chivalry*. London, England: Arms and Armour Press.

Total: 4

Sources – Late Medieval Composite Stechzeug "German Joust" Armor (2580)

*Primary Source Document on MyWPI to be used as well

Week-by-Week:

Week One:

History of Tournaments

Subtopics: How they came to be, Evolution over time, Types of Tournaments

Sources used:

Barber, Richard and Juliet Barker. (1989) *Tournaments, Chivalry and Pageants in the Middle Ages*. New York: Weidenfeld and Nicolson

Clephan, R. Coltman, (1919) *The Tournament, its Period and Phases*. London: Methuen and Co. Ltd

Crouch, David. (2005) *Tournament*. London: Hambledon and Continuum

Holmes, George. (1988) *The Oxford Illustrated History of Medieval Europe.* Oxford: Oxford University Press

Total: 4

Week Two:

History of the Joust

Subtopics: How it started, Evolution over time, Types of Joust,

Sources used:

Barber, Richard and Juliet Barker. (1989) *Tournaments, Chivalry and Pageants in the Middle Ages*. New York: Weidenfeld and Nicolson

Clephan, R. Coltman, (1919) *The Tournament, its Period and Phases*. London: Methuen and Co. Ltd

Crouch, David. (2005) *Tournament*. London: Hambledon and Continuum

Holmes, George. (1988) *The Oxford Illustrated History of Medieval Europe.* Oxford: Oxford University Press

Total: 4

Week Three:

History of Germany in Late 15th Early 16th Century

Subtopics: Formation of Modern Germany, Political, Economic, Social Situation

Sources used:

Barber, Richard and Juliet Barker. (1989) *Tournaments, Chivalry and Pageants in the Middle Ages*. New York: Weidenfeld and Nicolson

Dill, Marshall. (1961) *Germany, a Modern History*. United States: The University of Michigan Press

Fulbrook, Mary. (1991) *A Concise History of Germany.* Cambridge: Cambridge Printing Press

Holmes, George. (1988) *The Oxford Illustrated History of Medieval Europe.* Oxford: Oxford University Press

Kohlrausch, Friedrich (1844) *History of Germany; from the Earliest Period to the Present Time.* London: Chapman and Hall

Singman, Jeffrey L. (1999) *Daily Life in Medieval Europe*. Westport, CT: Greenwood Publishing Group, Inc.

Wende, Peter. (2005) *A History of Germany*. New York: Palgrave Macmillan

Total: 7

Week Four:

The Jouster

Subtopics: Who participated, Arms and armor, Horses, Details on Particular Armor

Sources used:

Barber, Richard and Juliet Barker. (1989) *Tournaments, Chivalry and Pageants in the Middle Ages*. New York: Weidenfeld and Nicolson

Demmin, Auguste. (1877) *An Illustrated History of Arms and Armour from the Earliest Period to the Present Time.* London: George Bell & Sons

Total: 2

Sources – English Pikeman Armor (360)

*Primary Source Document on MyWPI to be used as well

Week-by-Week:

Week One:

Renaissance Warfare

Subtopics: Battlefield Positions and Infantry Types, Equipment on the Field, Opponents Strengths and Weaknesses, Warfare Tactics and Strategies

Sources Used:

Arnold, Thomas 2005. The Renaissance at War.

De Gheyn, Jacob. (1999) The Exercise of Armes : All 117 Engravings from the Classic 17th-Century Military Manual. London: Dover Publications.

De Gheyn, Jacob. (2003) The Renaissance drill book. London, Greenhill Books

Fissel, Mark Charles. (2001) English Warfare 1511-1642. London; New York; Routledge

Forgeng. Primary Source Compendium

McNeil, William. The Pursuit of Power. 1982.

Norman, A.V.B. (1985) English Weapons and Warfare, 449-1660. New York: Dorset Press.

Webb, Henry J. (1965) Elizabethan Military Science "The Books and the Practice". Milwaukee: University of Wisconsin Press.

Total:8

Week Two:

Design of the Armor

Subtopics: Undergarments, Helmet, Chest Plate, The Pike

Sources Used:

Arador Armour Library (2003), Glossary of Armour Terms. Available online http://www.arador.com/glossary/index.html

Ashdown, Charles Henry. (1909) British and Foreign Arms & Armor. London: Edinburgh: T.C. & E.C. Jack.

Blair, claude. (1962) European and American Arms c. 1100-1850. New York: Bonanza Books.

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Ffoulkes, Charles John (1945), Arms & armament: an historical survey of the weapons of the British army. London: G. G. Harrap and company Ltd.

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Hewitt, John. (1855-1860) Ancient armour and weapons in Europe. Oxford, London: J. Henry and J. Parker.

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Oakeshott, Ewart. (1980) European Weapons and Armour. North Hollywood: Beinfeld Publishing Inc.

Wilkinson, Fred. (1978) Arms and Armour. London: Hamlyn Publishing Group Ltd.

Total:14

Week Three:

Making of Armor

Subtopics: The Armorers, Resources and Tools Needed to Create Armor, Design and Style for Pikeman Armor, Personalization or Mass Production

Sources Used:

Coggins, Jack. (1966) The Fighting Man. New York: Doubleday and Company.

Corvisier, Andre. (1979) Armies and Society in Europe 1495-1789. Bloomington: Indiana University Press.

Dillon, Harold Arthur Lee-Dillon. (1968) Armour: An Elizabethan armourer's album and Armour notes. York, Pa.: G. Shumway.

Ffoulkes, Charles John (1967), The armourer and his craft, from the xith to the xvith century. New York, B. Blom.

Fliegel, Stephen. (1997) The Making of Armor. Cleveland: The Cleveland Museum of Art.

Richardson. London Armorers. 2004

Meyer, Joachim. Art of Combat

Williams, Alan. The Knight and The Blast Furnace

Total:8

Week Four:

Era of the Armor's Use

Subtopics: People in Government, Political Climate, Why They Exist, What was the Purpose for the Wars this Armor was used in

Sources Used:

Allen, J W. (1957) A History of Political Thought in the Sixteenth Century. London, Methuen

Allen, J W. (1967) English Political Thought, 1603-1644. Hamden, Conn.: Archon Books

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Oman, Sir Charles. (1989) A History of the Art of War in the Sixteenth Century. London, Greenhill Books. 355

Parker, Geoffrey. (1988) The Military Revolution: military innovation and the rise of the west, 1500-1800. Cambridge: Cambridge University Press.

Seel, Graham E. (1999) The English wars and republic, 1637-1660. London ;New York :Routledge

Spurr, John. (1998) English Puritanism, 1603-1689. New York :Palgrave Macmillan

Tincey, John. (1990) Soldiers of the English Civil War. London, Osprey

Total:17

Sources – Edo Period Japanese Samurai Armor (3144)

Week-by-Week:

Week One:

Japanese History
Subtopics: Edo Period History, Historical and Cultural Context, Arms and Armor

Background, Samurai Background

Sources Used:

Morihiro, O. (2009). *Art of the Samurai : Japanese Arms and Armor, 1156-1868*. NY: Metropolitan Museum of Art.

Total:1

Week Two:

Samurai
Subtopics: Military Story, Other Troops on Battlefield

Sources used:

Miller, D. (1999). *Samurai Warriors.* New York: St. Martin's Press. JLF.

Oscar Ratti, A. W. (1991). *Secrets of the Samurai: a Survey of the Martial Arts of Feudal Japan.* Tuttle Publishing.

Total: 2

Week Three:

Armor
Subtopics: Origins, Styles, Protection, Uses, Disadvantages

Sources used:

Robinson, H.R. (2002). *Oriental Armour*. Dover: Dover Publications.

Thomas Louis, T. I. (2008). *Samurai: The Code of the Warrior.* Sterling Publishing Company.

Total: 2

Week Four:

Weapons

Subtopics: Japanese Blades, Relation to the Samurai, Techniques of Use

Sources used:

Irvine, Gregory. *The Japanese Sword: The Soul of the Samurai*. Weather Hill Inc, 2000.

Total: 1

Appendix B: Revised Script of Previous IQP

The Middle Ages were a time when power was concentrated in the hands of very few; education was dominated by the church, wealth was dominated by feudal land lords and battle was dominated by the armored knight. By the end of the middle ages new technologies were transforming European society. The printing press was spreading new ideas, while ocean going ships were bringing new wealth into the cities, but perhaps the most powerful of all was the technology that would revolutionize the face of battle as Europe moved into the renaissance. Where once the armored knight had ruled the battlefield, a new force was starting to break through his power—the force of gunpowder.

Early gunpowder was made from only three ingredients: charcoal to burn, saltpeter to provide oxygen, and sulfur to accelerate the reaction. Historians believe that gunpowder made it's was to Europe from china around the time of the Mongol conquests during the twelve hundreds. By the late thirteen hundreds gunpowder weapons had become a standard feature of European armies. The main hand held firearm was the hand cannon; as the name implies the weapon was little more than a small cannon mounted on the end of a staff for easier handling. The gunner ignited the gunpowder with a length of smoldering cord called a match. Manipulating this lit match cord made the hand cannon difficult to use, and dangerous to the gunner as well as the enemy. The weapon was also weak on power accuracy and reliability.

By the fourteen hundreds large cannons were becoming powerful enough to break down castle walls, but hand-held firearms couldn't pierce armor except at very close range. The first combat effective hand gun came into being in the late fourteen hundreds. Known as the harquebus or hooked gun this weapon had a sturdy wooden stock that allowed it to be aimed more precisely and helped to control the recoil when fired. Another improvement in the

harquebus was the ignition system called the matchlock. The matchlock was a trigger mechanism that applied the match to the gunpowder. This freed up the gunner's hand so that he could control the weapon better. The gunner would pull the trigger allowing the clip that held burning match to lower into the flash pan. The pan contained a small charge of gun powder that would explode sending flame into a small hole into the barrel; this set off the main charge of gunpowder into the barrel itself.

The soldier who used a harquebus was called a harquebusier. The greatest danger to the harquebusier was the cavalry men. Armies protected their harquebusiers with large numbers of armored pikemen. The pikemen could be arranged into a porcupine formation to hold off the cavalry, allowing the harquebusiers time to reload, pulling fire into the knights at close range. Tactics like these were used to deadly effect in battles like Pavia in 1525, where Italian foot-soldiers slaughtered French knights and captured the French king Francis I.

Firearms became even more effective in the late 1500's with the introduction of the musket, a more powerful and accurate version of the harquebus that could pierce plate armor at even greater distances. The power and accuracy of this musket required a longer and thicker barrel, making the weapon so heavy that the musketeer needed a forked rest to support it. This example from the Higgins armory is over five feet long and weighs more than twelve pounds. The increasing power of firearms forced cavalry to adapt their armor, giving up protection on the arms and legs in favor of heavier protection on the head and chest. This French cavalry armor from the early 1600's weighs 63 lbs, about the same as a medieval knight's armor, but it overs no protection to the arms or lower legs. This breastplate has had a reinforcing plate riveted to the inside, offering extra protection against firearms but substantially increasing the weight.

Clients insisted on having their armor tested or proofed against firearms. As muskets became more powerful, bulletproof armor had to be made extremely heavy. This breastplate weighs a punishing 24 lbs, much too heavy to wear on a march. It could only be used in siege operations where the soldier did not have to move around much in it. Firearms were tilting the battlefield in favor of cheap low-paid infantry, putting the armored horseman increasingly at a disadvantage. The matchlock mechanism required the use of both hands and could not be used on horseback, but European inventors, among them Leonardo Da Vinci, were trying to develop a mechanism that would allow a horseman to use firearms.

By the late 15 hundreds, craftsmen were producing a new ignition system known as the wheel-lock. Instead of the burning match cord the wheel-lock used a spring loaded wheel scraping against pyrite to generate sparks and the mechanism is comparable to a modern lighter. When the wielder pulled the trigger the striker arm holding the pyrite would drop into the wheel, creating sparks that ignited the gunpowder in the flash-pan. Cavalry were issued short wheel-lock firearms like this carbine and this pair of pistols from the Higgins collection. The wheel-lock was safer than the match-lock and also allowed the weapon to be fired in wet weather, but it was expensive and easy to break. Many surviving examples were ceremonial weapons issued to personal bodyguards, like this pistol for a soldier of the bodyguard of the prince of Saxony.

At the same time gunpowder's' shock-waves were spreading to other parts of the world. The emperor Babur founded the Mughal dynasty in India during the early 15 hundreds. Thanks to his skill in exploiting the new technology, his central Asian cavalry were used to shooting bows on horseback and they had little trouble adapting to firearms. The Mughal army even used armored war elephants to carry cannons on their backs, but the most dramatic impact of firearms was in Japan. Harquebusiers were introduced by European traders in the 1540s, and the

Japanese quickly began manufacturing their own improved versions. It was the great warlord Tokugawa Aiyashi, the unifier of japan, who first realized the potential of the new weapon. In 1575 Tokugawa used his guns decisively at the battle of Nagashino. An opposing warlord was laying siege to Nagashino castle when Tokugawa approached with an army that included over a thousand harquebusiers. Tokugawa used an innovative strategy that won him the battle. He deployed his harquebusiers behind a stream and built wooden stockades in front of his troops to slow down the enemy cavalry making an easy target. Tokugawa also trained his soldiers to take turns firing; after the front row of harquebusiers had fired they would step back behind the second row, who would fire a second volley, allowing the troops to maintain rolling gunfire on their opponents. Tokugawa finished off the surviving enemy cavalry with spear-men who were mixed with the harquebusiers similar to European pikemen.

After Tokugawa became shogun of japan in 1603, he and his successors banned firearms except in a few licensed arsenals. The Tokugawa shoguns feared that gunpowder weapons were a threat to traditional samurai society and might be used to start a rebellion. Firearms would not become a significant part of Japanese armies again until the late 18 hundreds when japan re-opened contact with the outside world. Tokugawa's suspicions about firearms were confirmed by events in Europe where the evolution of firearms was transforming society in the late 16 hundreds.

Europeans armies replaced pikes with bayonets, a short blade that attached to the end of a musket. Now, every musketeer could serve as his own pikeman and the modern infantry men came into being. The older match-lock ignition was also replaced by the flint-lock, which created sparks with a sharpened flint striking against a steel surface. Before firing, the wielder would cock the hammer containing the flint. When the trigger was pulled, the flint would strike

the metal pan cover. This opened up the pan and created sparks that ignited the powder. The flint lock ignition made muskets far more reliable while improving metal technology allowed the weapon to become lighter, no longer requiring a rest.

By the 17 hundreds armor had given up the arms race. Armor that could stop a bullet was too heavy to wear in battle, so soldiers gave it up entirely except for a few specialized and ceremonial uses. The changing military technology brought social revolution in its wake. The power of the old feudal aristocracy was based on the power of the knight, trained since childhood in the arts of hand to hand combat and using an expensive horse and armor that only a nobleman could afford. Now an ordinary farmer or laborer could be trained for battle in a matter of weeks, armed with a cheap, mass produced firearm. As armies came to be dominated by ordinary people, these people started to expect a say in government, as well. During the 1600s, England twice overthrew its own king with armies based on ordinary foot-soldiers, establishing in 1689 a bill of rights for its citizens. A hundred years later, American colonists would throw off English rule using this same firearms technology, and France would have a revolution of its own, abolishing one of Europe's oldest monarchies. The age of the knight in shining armor and the feudal order he represented had once and for all fallen in the face of the socially explosive technology.

Total Words: 1575

Target Words: 1600

Appendix C: Age of Armor Script

Before the age of the modern tank…	
Before the age of the modern infantry…	
There was…	
<u>The Age of Armor</u>	3 armors
The knight was lord of the battlefield in the Middle Ages. He owed much of his advantage to his custom-made, technologically advanced suit of armor. Very few complete suits of medieval armor survive today, and the parts of this armor originally came from separate suits made in Italy between 1440 and 1505.	
Children in the 1400s had little freedom of choice in their futures. A boy born into a noble family found himself groomed for knighthood from birth, learning manners and the values embodied in the knightly code of Chivalry.	 
Around the age of six, he was sent away from home to serve as a page in his lord's castle. There, he ran errands and learned to ride, as well as other basic knightly skills.	 
At fourteen, the boy became a squire and continued his apprenticeship under one knight who trained him as a fighter. The squire led the knight's support crew in battle.	  
The knight could not get into his armor by himself and needed the help of his squire and servants. The knight first put on an arming doublet,	Dressing armor footage

a padded jacket that provided cushioning against the steel plates. Sections of chain mail attached to the doublet to cover gaps in the armor, such as the armpits, inside the elbows and between the legs.	
Next, the squire would assemble the armor piece by piece from the feet up. Some pieces were laced and others fastened with buckles, hooks or catches.	Footage of the straps
Plate armor moved easily with the knight's body, thanks to a system of overlapping plates easily seen on the gloves and shoes.	Footage of overlapping plates followed by footage of knights moving
However, the armor was not without its drawbacks. Visibility was extremely limited through the thin eye slit and breathing was an issue when the helmet was closed for battle.	Footage of helmet
The armor was costly to make, the price comparable to a sports car today. The suit was custom-made for the knight and each piece was carefully hammered into shape from flat steel plates.	 
The pieces sometimes had armorer's marks to prove their quality; the breastplate of this suit bears the trademark of Giovanni dei Barini, who founded Italy's most famous dynasty of armorers, the Negroli.	Footage of armorer's mark
A knight's armor was designed to be fashionable, as well as protective. The angular lines and ridged surfaces of this suit call to mind the Gothic cathedrals of the Middle Ages, and the shoes imitate the pointed toes of fashionable medieval footwear.	Footage of armor's shoes on one half with …

	 
Once armored, the knight was ready to be armed. This knight is equipped for combat on foot with the warhammer. The warhammer was ideal for fighting other knights in plate armor: it has a strong tip to penetrate gaps in the opponent's armor, a sharp beak to pierce plate, and a pronged hammerhead to deliver powerful blows.	warhammer footage
On horseback, a knight's first weapon was the lance. This armor has a lance rest that helped control the 12 foot lance and absorb the impact when the charging knight collided with his opponent.	 
After using the lance, the knight might draw his sword which always belted around his waist.	Footage of sword fight

One of his most valuable assets on the battlefield was his warhorse, a highly trained animal that wore protective plate armor like its master.	
Fighting on horseback was extremely difficult and knights spent much of their time practicing. Over the course of the Middle Ages, what started out as battle training became the tournament, a sporting event that would remain popular well past the age of the armored knight.	 
Tournaments featured many combat sports, including jousting, which could be played with various rules using specialized equipment like this German rental armor from around 1500.	
Tournaments began as large "mock battles" where hundreds of knights and footsoldiers fought across acres of open land. By the 1300s, the focal point of the tournament was the joust, where knights competed one-on-one with lances on horseback.	

The objective of the joust was to score points. The rules of jousting varied from one tournament to another, but generally a jouster scored points depending on how well he hit his opponent. He could score simply for hitting his opponent; he could score higher for breaking his lance with a really solid hit; he scored highest of all if he could knock his opponent right out of the saddle.	  
Since jousting was a controlled sport, emphasis could be put on protection rather than mobility. To increase protection, the armor was extremely thick and heavy, almost immobilizing the jouster. At about 60 lbs, this suit weighs the same as a full battle armor even though it covers only the upper body. The plates and padding on the horse eliminated the need for leg armor.	Image of thickness of armor  
The helmet was fastened to the body armor with large bolts, forcing the jouster to look forward. This armor could be rented by anyone who wanted to joust, so it includes holes to adjust it for different sized jousters.	Footage of the bolts followed by footage of the holes
The suit was accompanied by a shield that served as the opponent's target.	Footage of the shield with the lance from the museum

The shield had a small portion cut out on the right to allow the jouster to aim his lance across it.	
On the suit is an adjustable lance rest far larger than the lance rests of battlefield armors. The lance rest has a tail in back called the queue.	Footage of the lance rest/queue
The queue acted as a sort of extra hand that held the lance in place as the jouster rode towards his opponent at full force.	Footage of queue
The lance tip was divided into 3 points in order to avoid piercing the armor or entering the eye slot. The impact of lances has left behind 3-point gouges that can still be seen at the throat of this armor.	Footage of the lance tip followed by footage of the gouges
Jousting would remain a popular pastime until the early 1600s when firearms were making armor and lances obsolete.	  
Meanwhile, across the globe in Japan, medieval knights had a counterpart in the samurai. Like the knight, the samurai came up against firearms in the 1500s, but here history took a very different turn. In the early 1600s, the Shogun Tokugawa legislated to preserve Samurai tradition by banning the use of firearms in Japan. Although Japan would remain at peace until the late 1800s, Samurai continued to wear traditional medieval-style armor. This suit was made in the 1700s, at a	

time when armored knights were only a distant memory in Europe.	
In Japan's Middle Ages, the samurai, like the knights, were the top warriors on the battlefield, fighting for the lords of the warring clans of Japan who wanted to win the title of Shogun, the military general who was the true ruler of Japan. The rule of the Shogun was based on military power and when a new warlord could defeat the current Shogun, the emperor would appoint him as the new Shogun.	
The samurai underwent specialized training throughout much of their early life in preparation for their role as aristocratic warriors. Their training started in childhood in a specialized school curriculum that combined physical training, cultural studies, poetry and spiritual discipline.	
Like his knightly counterpart, the Samurai learned to follow a code of conduct known as bushido, defined by important values like loyalty and courage.	
Upon completing his training, the samurai was sworn to the service of his lord. The lord paid his Samurai in stipends of rice, which could be sold for money. With this money, the Samurai could purchase his expensive suit of armor.	
As with the knight, Samurai armor was complex and had to be put on in a specific order. They started with	

the hitatare, a long-sleeved wrap shirt and long pants. Whereas the knight would get dressed from the feet up, the Samurai started with his arms, then continued from the feet up. This suit originally included leg guards and sandals.	
Modeled after the armor of Medieval Japan, it is based on lacquered leather instead of iron plates. Because this armor was purely ceremonial, the samurai could sacrifice protection for comfort. Each small plate was made of lacquered leather laced together. Over the arms are sections of iron chain mail.	Footage of armor
On his helmet, the Samurai wore his family's emblem, and the colors of the armor identified the warrior and his family.	Footage of crest
On the back is a pin used to attach the flag of his lord during battle as a symbol of his allegiance, and	Footage of pin followed by 
over his face he wore a mask to instill fear in his opponents as well as protecting his face.	Footage of mask
This Samurai armor is far more ornate than the knight's armor, adorned with floral decorations like the gold chrysanthemums on the arms and skirt. Flowers were an important symbol for the Samurai.	Footage of floral pattern

According to one medieval Japanese proverb, "The flower of flowers is the Cherry Blossom. The samurai is the man among men." This proverb compares the cultured Samurai to a flower; both were beautiful and perfect, and both were doomed to die in the prime of life.	
A Samurai's weapons were always carried in the sash around his waist.	 
The Katana was the primary weapon, a lethal blade that also demonstrated the Samurai's artistic sophistication through its	Footage of katana
tsuba, or hand guard. The tsuba was adorned with a tasteful design that expressed the samurai's aappreciation of art and nature, with designs that depicted religious themes, scenery, plants and animals.	Collage of tsubas **Collage of Six Tsubas from the Higgins Armory Database**
The samurai's short sword, or Wakizashi, was used for close combat and also served for self defense off the battlefield.	Footage of wakizashi
The age of the Samurai lasted into the 1800s, but, like his European counterparts, the Samurai eventually fell in the face of firearms and modern warfare. But today, the spirit of the knight and samurai still lives	3 suits fading out into black (tentative ending)

on in the legends familiar to us in books, video games, and movies, and in precious surviving artifacts like the ones you will see here at the Higgins Armory Museum.	

Current Word Count: 1623
Target Word Count: 1600

Appendix D: Protocol for the IQP Process

The PQP

The Project Proposal

- Review the project prospectus and understand deadlines
- Scope the project proposal into a manageable project
- Decide on the main topics and subtopics of your project
    - For example, a main topic would be the armor and a subtopic would be an aspect about that armor like history, person in the armor, weapons or details about the armor specifically
    - Be sure that the subtopics extensively cover the main topic and don't leave unanswered questions
- Write the Introduction for the Project Proposal
    - Iterate document
- Find potential sources for each topic
    - Locate at least 20 potential sources per topic
    - Iterate document
- Write the Conclusion for the Project Proposal
    - Iterate document
- Identify key assets to include in written essays and in videos
- Generate a list of consultants
    - Potential talking heads
    - Potential groups for generating footage

    - Potential library personnel for assistance with Adobe Premier and other research and software programs
- Generate a list of media resources
    - Music (not copyrighted or obtain copyright privilege)
    - Higgins Armory Museum Video Database
    - Higgins Armory Museum Image Database
- Put together the Project Proposal for final approval
    - Iterate document
    - Update document at end of each term

The First Term

Researching the Armors

- Focalize sources for each topic
- Obtain books and other resources for research
    - Library
    - World Cat and Illiad
    - Google Books or other internet websites
- Note key information and page numbers from specific research books
    - Note all important page numbers and specific quotes you would like to use
- Research each topic separately at one topic per week
    - Iterate each document every week
- Include relevant images and visuals
    - Use images from Higgins Armory Museum database
    - Use images that clearly identify and help support what is being explained

- Scope the works cited to only include sources used in the documents

Writing the Essays

- Write each topic separately at one topic per week
- Iterate documents
- Compile individual topics into one final work
    - Include images and visuals (and check to make sure that they are in correct locations)
    - Refer to images and visuals in text
- Include citations at the end of each paragraph
    - Use APA format (refer to reference books for correct formatting techniques)

The Second Term

The Script

- Generate a list of basic topics to be covered in the script
- Determine the tone and theme of the script
    - Ex: Would you like the video to sound like a story or would you like it to sound like an interview, etc?
- Compile notes from completed essays on individual documents
- Split the script into separate sections based on topic
    - Within each topic, split the script into different ideas(ex: swords, how to get dressed, rules)—these can be one-three sentences long and will only have one type of image associated with it
- Format the script as in Appendix C
    - Use the table format to clearly distinguish between each idea

    - Ensure that the order of the text is how the script will be read—fluidity and logically
    - Provide each idea with multiple images to serve as a repertoire to choose from
    - If possible, format document in landscape to allow more space for images
    - Save as PDF when emailing so that it does not exceed email limitations
- Iterate script

The Images

- Determine the types of pictures needed based on script
    - Think of as many synonyms of the topic as possible
    - Type in all these words into Google, or another search engine
- Think of the style of picture that you want
    - Use relevant styles of art for the time period you are looking for
    - Find high resolution images (at least 600x600)
    - Determine that the image is not copyrighted or obtain copyright privileges
- Sort images into folders
    - Categorize folders based on topics
    - Make sure to number both the folders and the pictures in a way that allows anyone to know what order they come in for the final product

Preparing for the Video

- Compile the preferred images
    - See above for categorizing and organization methods
- Generate all footage
    - See above for categorizing and organization methods

    - Narrow footage down to only good-quality footage
- Begin brainstorming introduction and conclusion
- Refer back to media resources and key assets to confirm all necessary components have been included

The Third Term

The Narration

- Decide on who you would like to be your narrator (use only one narrator for the video's entirety except for talking heads)
- Set up recording time in a good sound-quality room (no echoes, pre-set equipment, etc.)
- Record narration in small chunks (use the small chunks generated in the script format)
    - Discuss only one idea per chunk (allows easier connection between words and images)
    - Clearly label or number each narration recording in order
- Select music that flows with the narration
    - Generate a list of different music compositions for different tones

The Video

Organize your materials

- Create a folder(bin) structure to keep things tidy
    - Separate media types (audio, video, and pictures) into folders (right click, New Bin or click the folder button at the bottom)
    - In each media type folder, create subfolders for topics or sections in the video
- Importing is easy!
    - Locate your resources

    - Make sure the files stay in the folder where they are (if you move them you will have to re-link the media or have big red error messages)
    - Select the files for each section
    - Drag and drop them into the appropriate folders and/or subfolders
- Lay out your narration sound files first
    - To make sure your video matches up to your narration
    - Right click on the timeline bar and rename it from “Audio #” to “Narration”
    - Drag and drop your files from the folders to the timeline
- Match up pictures and video to narration
    - Using the narration track as a snap guide you can easily place images and videos on the timeline
    - Adjust timing to keep the images flowing with the narration
- Add transitions
    - Select the effects tab
    - Select the type of transition
    - Drag and drop it onto the center line between two pieces of media
- Add movement to pictures and video
    - Scaling helps to remove those unsightly black bars
    - Panning keeps the audience from getting bored
    - Zooming in adds focal emphasis to still images
- Add music tracks
    - Pick some music that fit’s the mood/style/theme of a section
    - Fade ins and fade outs can be added just like the visual transitions

- Balance audio levels
    - The narration, video sound clips, and music must be adjusted so you can hear the important parts
    - Fade ins and fade outs in music can add feeling to certain sections, but over doing things can be distracting
- Export finished video
    - Under File select export
    - Select the formatting to go best with what you are displaying the video on
    - Render the file and test it out on the player that you will be presenting on

The Final IQP Report

- Compile all individual essays into one
    - Ensure fluidity and same formatting between all documents
    - Ensure all images are in the correct places
- Write the Introduction
    - Utilize the introduction from the Project Proposal as a template
- Write the Conclusion
- Write the Abstract
    - 80 words or less, only
- Write the Acknowledgments
- Generate all items to include in the Appendices
    - Documentation of product, such as script, sources, etc.
    - Budget/equipment lists, if applicable
    - Documentation of copyright privileges, if applicable
    - Team biographies and photo

- Include all other miscellaneous items/information relevant to your specific project

FAQs

Q: I ordered my books, but they haven't arrived yet. What should I do?

A: Check to see if they are available in Google Books, the internet, the school library or a local library like the Higgins Armory Museum library, or try to use other sources instead. You can also ask Prof. Forgeng to see if he can assist you with obtaining the book.

Q: How do I know which topics and subtopics would best fit the project?

A: Iterate your choices with Prof. Forgeng—he can help determine if they are worth pursuing or if they wouldn't be of any value to the project. Also, choose subtopics that cover the topic and discuss all aspects of the topic and the project.

Q: Can I use other citation formats like MLA?

A: Unfortunately, no. APA is the required format for IQP Projects. Prof. Forgeng, or reference books, can show you how to use APA format if you are unsure.

Q: Why is it beneficial to generate a list of basic topics that I would like to include in the script before writing the script?

A: This helps you to scope out the script and the video, deciding on where you would like to go with it. It also helps to narrow down the list so that you have a clear-cut idea of where to continue from.

Q: How many pictures should I include for each idea?

A: As many as is needed. Generally, three to four would be the best as this would allow freedom for choosing the best image and discarding any images that are not usable.

Q: I can't find any pictures that fit my topic. What should I do?

A: Try breaking your topic into subtopics and searching for those. Sometime you get lucky.

Q: I found a good picture but it's too small to use. Can I not use it?

A: Yes, you can—right under the image, if you place the cursor over it, you should see a 'more sizes' option. If you click on that, you should see multiple versions of the desired image in all possible sizes. Use the biggest one.

Q: How can I tell if something is copyrighted?

A: If it has any form of a watermark on it, then it's copyrighted. If it's a modern image or a photograph of something, it's most likely copyrighted. If you aren't sure if it's copyrighted or not, then it probably is. You can also confer with Prof. Forgeng.

Q: Why am I having trouble putting pictures onto Google Docs?

A: Upload the pictures onto the website, open the uploaded pictures and drag them right into the document. Google Docs is best used for only text documents, so we suggest adding the pictures after you transfer the document to MS Word.

Q: Who can we contact for assistance with video editing and other research questions?

A: Contact the library and the ATC. They will set up one hour sessions with you to teach you the basics.

Q: Some of my MP3 files aren't working well in Adobe Premier, how do I fix this problem?

A: WAV files work better. Do your recordings and get your music in WAV.

Q: How do I break a large video into multiple smaller video clips?

A: Select the Razor tool that is located in the bottom right hand corner. Click the video clip in the time line where you want to have the break.

Q: What if I don't want to use Adobe Premier Pro to edit my video?

A: Good luck with that. You can always use another program like Camtasia, Windows Movie Maker, or you can always talk with someone in the ATC.

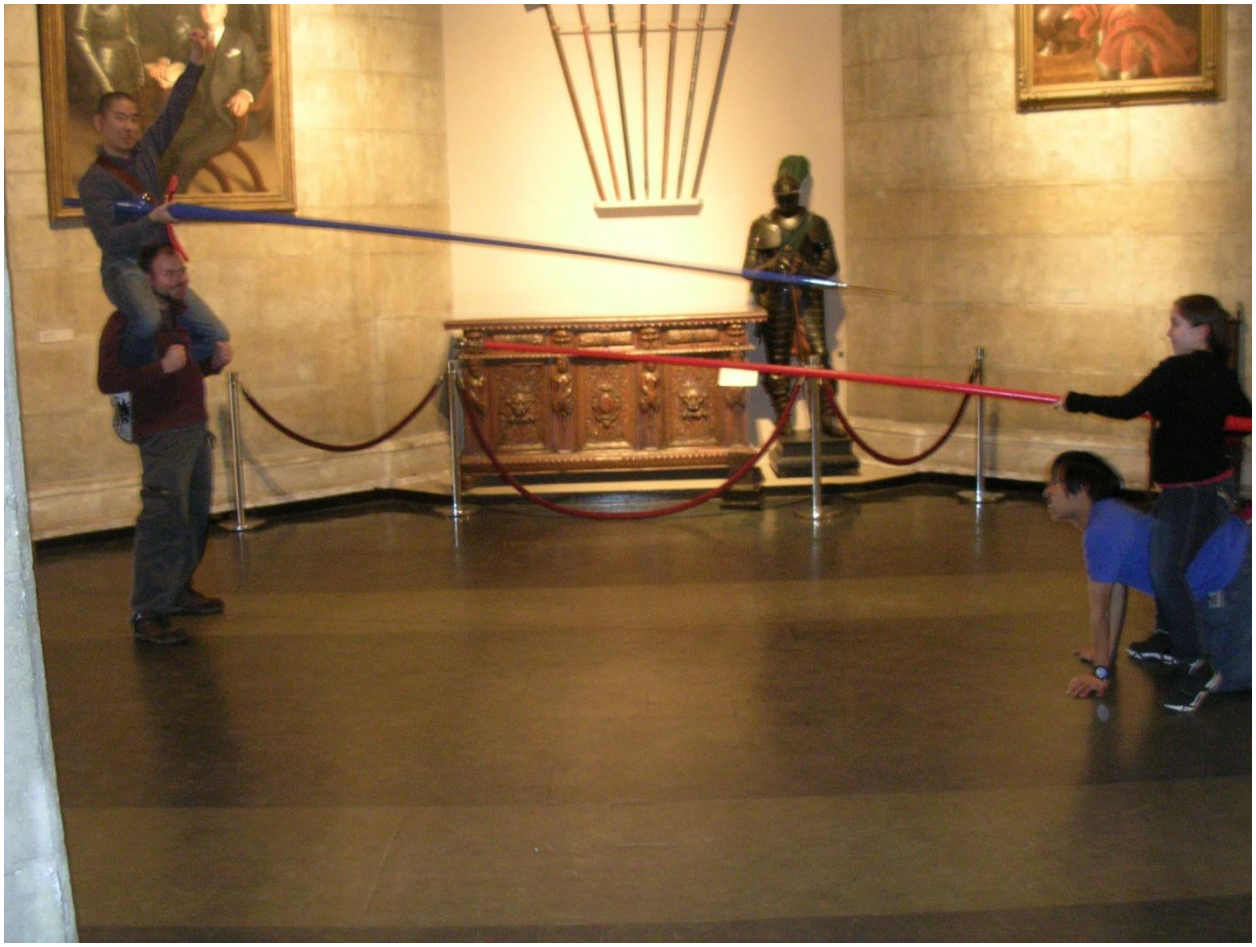
Q: One of my files is not linking properly, what do I do to fix it?

A: Find the file in the bin(folder) and right click, select link media, use the file browser to locate and select the file.

Q: Why does my picture look better in another viewer than it does in Premier?

A: When the file is scaled up or down it may look distorted. If the dimensions of the image are lower than the dimensions of the video it will appear pixelated. Select images with higher resolution than the video you are rendering.

Appendix E: Team Biographies



Bethany Almeida

Bethany Almeida is a third year undergraduate student at Worcester Polytechnic Institute from Bridgewater, MA. She is double majoring in Biomedical Engineering and Professional Writing with a minor in Spanish. Having previously visited the Higgins Armory Museum, she was intrigued by its history and was interested in learning more, and this project provided her with just that. She feels that this project helped her to understand how to see things from the eyes of others who may not know as much about the subject. It also helped her to understand the importance of team dynamics, a skill that will carry with her in all future endeavors.

Keon Seok Bang

Keon Seok Bang is a senior at Worcester Polytechnic Institute. He is pursuing a Bachelor's of

Science degree in Mechanical Engineering. His experiences from completing his Major Qualifying Project and serving in the United States Marine Corps have enabled him to benefit his team, despite being the last member to join. He has never been to the Higgins Armory Museum prior to this project but has also been interested in medieval armor and weapons. His versatility has been his most valuable asset in helping his team.

Alex Gray

Alex Gray is an Interactive Media and Game Design Art Track Junior in the class of 2013. He is involved in WPI theatre groups as well as Kilroy Sketch Comedy. This project fits in with his background and experience with video and audio recording and editing.

Paolo Masakayan

Paolo Masakayan was born in 1990 in Queens, NY. He is a junior at WPI, Worcester Polytechnic Institute, in Massachusetts, and he is aiming for a Bachelor's Degree in mechanical engineering. He is not that big into sports and would rather spend his time reading a good book. He currently lives in a secluded area in Long Island with his parents, and two brothers, aunt. His current passions usually involve Japan and its culture, and he has high hopes that he will be able to visit Japan sometime in the future.

Appendix F: Videos

Attached is a DVD containing the video for this IQP project.

Attached are the materials for the previous IQP's video.